AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 6 No. 13. WEEKLY. | NEW YORK, MARCH 31, 1883. | $3.00 per Annum. SINGLE COPIES, 6 CENTS.

COPYRIGHT, 1883, BY AMERICAN MACHINIST PUBLISHING COMPANY.

For Sale Everywhere by Newsdealers.

ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Universal Automatic Gear Gutter.

The advisability of using accurately-cut gears for transmitting power, in many instances where cast gears have formerly been considered "good enough," if not satisfactory, has stimulated improvement in machines for cutting gears, not only accurately, but cheaply. A large part of the expense of gear cutting is the wages of a skilled attendant, whose time is, in the operation as ordinarily performed, constantly occupied in the work of cutting. In order to cheapen the process of gear-cutting by rendering this constant attendance unnecessary, various machines, more or less automatic in their operation, have been from time to time introduced, and have met with considerable favor where much of the class of work on which they can be employed is done. It is evident that, in order to realize the full advantages of automatic operation, the machine must perform all the operations necessary to the cutting a gear wheel, as when it does this it substantially dispenses with hand labor, so far as the cutting is concerned.

The engraving herewith presented represents a new universal automatic gear-cutting machine, the term "universal automatic" being used in the sense that literally all the motions necessary to completely finish the cutting of the wheel, after the machine is started, are performed by the operations of the machine itself, whether on spur, bevel or worm gearing.

This machine represents several years' study of the subject of automatic machinery in connection with the processes of gear cutting, with the object of producing one that should be quite automatic in its character, positive and correct in its motion, and at the same time simple and comparatively cheap in its construction; in other words, a machine with which it would be possible to produce accurately-cut gearing at a little advance in cost over cast gearing.

It will be seen from the engravings that the operating mechanism is mounted on a rectangular frame of suitable height, with a projecting vertical arm, the whole being of a form best adapted to the purpose of receiving the necessary parts. The wheel to be cut is adjusted on a mandrel projecting from the slide, as shown. This slide is guided on V's, and is adjusted vertically to the size of wheel, and to the exact depth of tooth to be cut, by means of the hand wheel shown on the top of the machine, the adjusting arrangement registering to the thousandth of an inch. When thus adjusted, and the machine set for the proper divisions, the cutter is fed through, there being twelve changes of feed to accommodate different materials being operated upon. The cutter is then returned, the return motion being thirty-two times as rapid as the forward or feed motion. After one tooth is cut, the motion of the machine withdraws a stop, when the upright shaft shown at the side of the machine operates to revolve the wheel to the next space to be cut, the arrangement being such that the division cannot be incorrectly made, when it is locked for the next cutting movement of the cutter. These motions are automatically repeated without danger of mistake until the cutting is completed, which is signalled by the striking of a gong, thus warning whoever has it in charge to place another wheel for cutting.

The necessary motion of the upright shaft is made by means of a belt on the friction pulley shown near the top of the machine, which is driven by a small pulley on the countershaft. This friction pulley turns loose on the shaft at such times as the stop prevents the upright shaft from turning, the friction being sufficient to turn the shaft when the stop is withdrawn. The rim support, shown under the mandrel, can be readily adjusted to any position, or removed entirely when not required, by simply loosening two bolts. Its use is a great convenience in cutting large wheels, enabling the cutting to be done faster and surer than without its use.

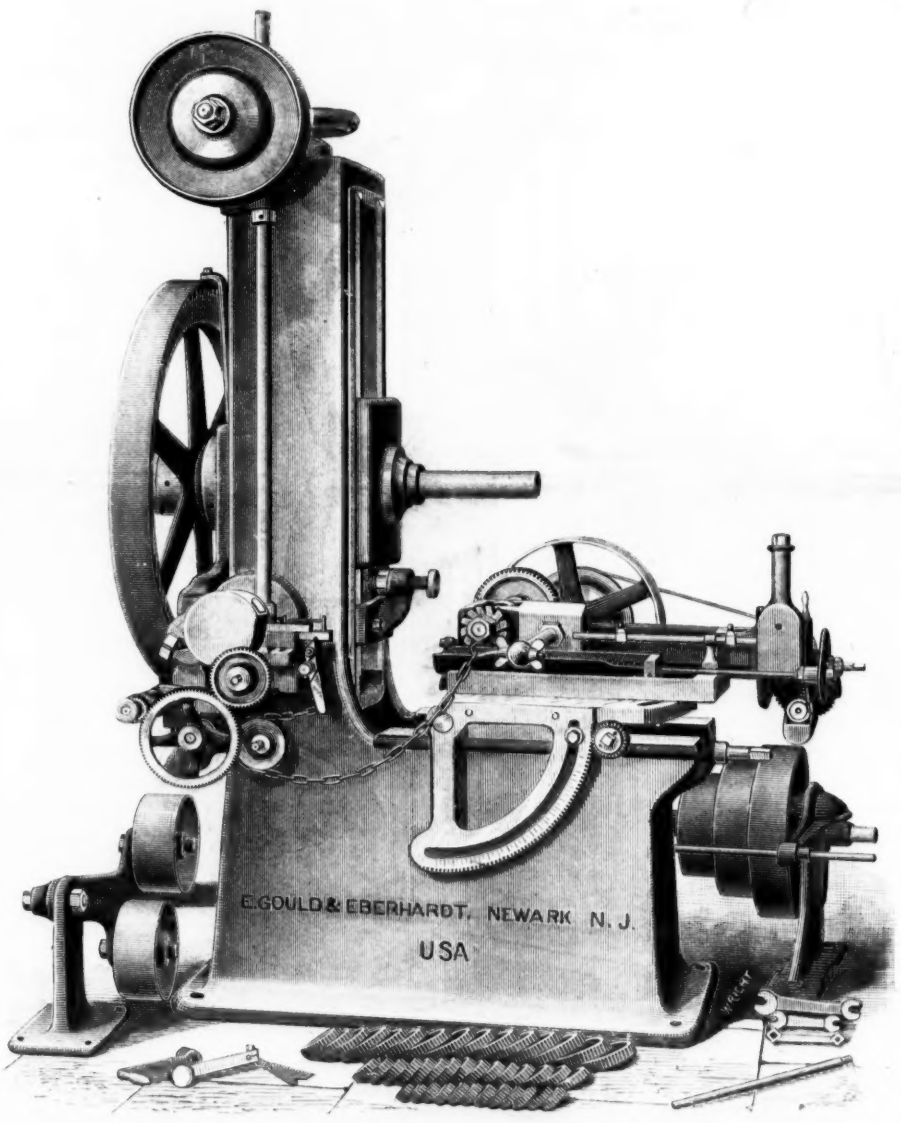
In cutting bevel or miter wheels, the adjustment of the cutter slide is made by means of the worm wheel and graduated quadrant shown, to thousandths of an inch; in fact, the setting of cutters and setting over for worm or bevel wheels, etc., are all done to accurate graduations, enabling these operations not only to be performed with great accuracy, but with dispatch.

The rim of the dividing worm wheel is made in two sections firmly bolted together, so that by loosening the two sections and shifting their relative positions, after it is cut, its accuracy can be readily tested. In use, the worm can be withdrawn from the dividing wheel when it is desirable to test large wheels before cutting.

In cutting wheels with a machine of this character, where the cutting is going on without the presence of an operator, the accumulation of chips is found to be a serious inconvenience, often injuring the bearings and other parts of the machine. To avoid this in this machine, an ingenious device is employed, which removes the chips as fast as made, depositing them inside the hollow base, where they can be taken out when cleaning shop, or at any other convenient time.

The machine is of a construction to be readily comprehended, and requires no special skill to adjust. It is strong in its general character, with ample bearing and wearing surfaces and strongly geared, the intention being that the speed of cutting shall be gauged only by the ability of the cutters to stand the work. Wrought iron work subject to wear is case-hardened, and the necessary wrenches, &c., furnished.

These machines are made in any desired sizes by E. Gould & Eberhardt, Newark, N. J.



UNIVERSAL AUTOMATIC GEAR CUTTER.

Locomotive Engine Running.

BY ANGUS SINCLAIR.

HIRING LOCOMOTIVE ENGINEERS ON LETTERS OF RECOMMENDATION — SLIPPING ECCENTRICS — AVOID JUMPING AT CONCLUSIONS — TROUBLE FROM A HEATER COCK.

Letters of recommendation are often very unreliable testimony upon which to hire locomotive engineers. Through the influence of three or four unexceptionably good letters, Anthony Stabler was hired by the Missouri Southern as a first-class locomotive engineer. Anthony had done some railroading in his time, mostly on the tops of box cars, it was presumed, and it afterwards turned out that he was an excellent barber; but as a locomotive engineer he was a pronounced failure. There is no telling what damage this man might have caused, had not an accident on his first trip revealed the value of his high recommendations, and put an ignominious end to his career as an engineer. He took out a good Grant engine, but got over only fifteen miles of the division, when a message reached headquarters intimating that the engine had slipped all the eccentrics, that she had got short of water, and that the fire was dumped. A man was despatched to bring the engine home, and subsequent investigations into the case developed the following facts: The engine and train went along all right till the closing trouble came, which was heralded by a persistent rattling of the reverse lever, followed by a violent lameness; then the train stopped because the engine could not pull. Stabler got down, examined the motion, and concluded that the right go-ahead eccentric had slipped. That was a mishap which he professed to be intimately familiar with, and setting an eccentric was the easiest matter in the world to him. So he got the tools, and proceeded, amidst intense exertion, to move the eccentric to its proper position, and fasten it there with the set-screws. The tools were all picked up, and Stabler climbed into the cab, threw the lever into the corner, and pulled her open; but somehow the engine did not seem disposed to go. Then he pulled the lever back, and tried that way, and found that she would go back a few feet, and then she would go ahead about the same distance without reversal. This led him into the belief that the back-up eccentric had also slipped; so he proceeded to change its position on the shaft, a feat which was not performed without much struggling and hard twisting with a steel bar. Again he got up, ready to go, and again the engine refused to move out of its swing-boat method of progression. Another inspection of the motion was made, which conveyed the impression that the eccentrics on the other side had also slipped; and Stabler was proceeding to wrestle with them, when the low condition of the water required his attention to the dumping of the fire. Then a train came along, and pushed him to the nearest station. An examination of the engine in the round-

house showed that a broken valve-yoke was the real cause of the trouble. The eccentrics had been set all over the shaft at random.

Set-screws, alone, form a very poor method of holding an eccentric on the shaft. The valve motion of locomotives is planned for a certain eccentric position, and there is no worthy reason why the eccentrics should not be keyed there. Set-screws do all right for a few years, while snug fitting remains tight; but when the eccentric beginsto get worn (and the motion generally gets out of order) there is no end of trouble with eccentrics slipping on the road. Then the expense of delays that arise from this source is often serious. On roads where set-screws alone are used to fasten them on the shaft, the slipping of eccentrics is such a common occurrence that every man connected with the running of engines knows exactly how to go about the work of re-setting, so that the work may be done expeditiously. But, even where the engineer is an adept at this business of re-adjusting eccentrics, the job is often very tedious. Especially is this the case where the go-ahead eccentric is located next to the axle-box. It is nearly always the forward eccentric that slips; consequently it ought to be placed where it could be easiest reached, but in many instances this matter of convenience is neglected. And where the go-ahead eccentric is placed next the axle-box, the strap of the other eccentric often has to be taken down before the set-screws of the first one can be got at. In this, and in many other respects, some locomotive builders shadow their own interests by neglect of what are considered minor matters. Different makers would enhance the popularity of their engines by constructing them so that the parts could be easily taken apart for repairs or examination. Repairs are inevitable on running engines, and accidents will happen on the best regulated roads. Apart from the matter of convenience to engineers or workmen, it is of considerable consequence to owners, as a question of expense, to have engines that are easily taken apart when repairs are needed.

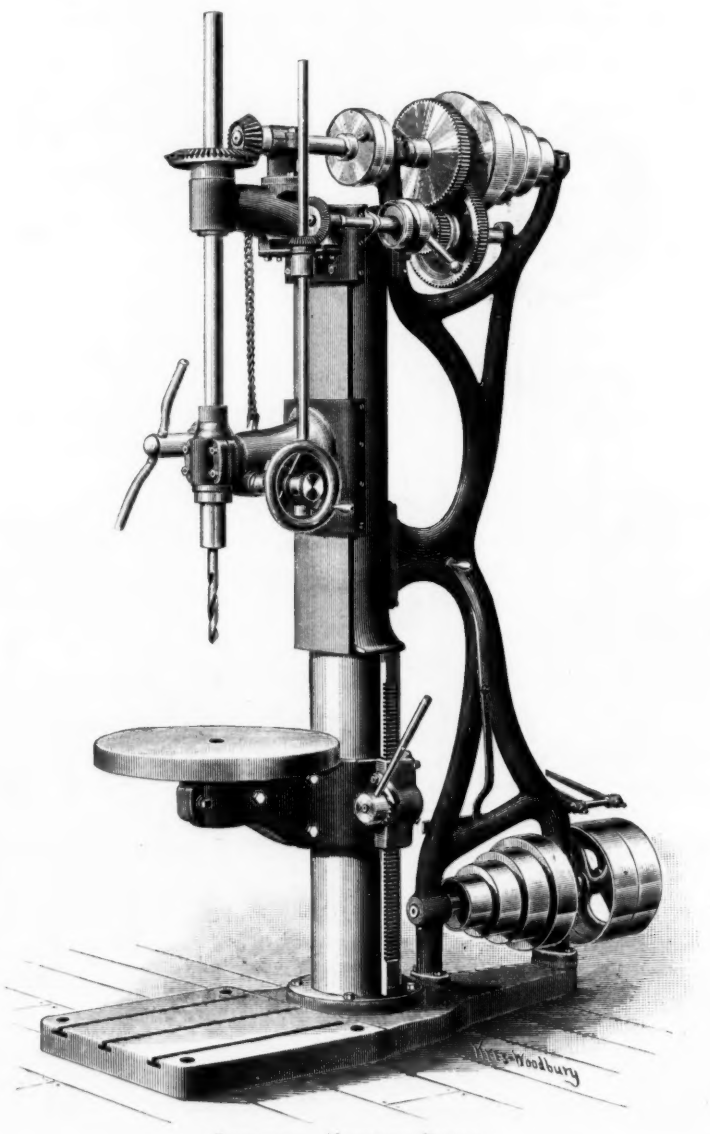
Where eccentrics are habitually slipping, engineers become liable to jump at the conclusion that an eccentric has slipped, every time anything goes wrong with the valve motion so as to impede its action. In locomotive running it is a good plan not to assume anything until examination has confirmed the first impression; for in no other business does the unexpected happen so often. To ascertain the exact cause of Stabler's dilemma was an easy matter, had he known the right method to go about it. An experienced engineer would have various ways of identifying the cause of trouble. A young engineer might know tolerably well how to run and manage the engine, yet be deficient in the experience which tells how to distinguish promptly an unseen cause that is disabling a locomotive.

If a young runner cannot tell from inspecting the eccentrics whether or not they have moved, he can prove them quickly by placing the engine on the centers. Uncouple from the train and steam ahead, or pinch the engine till the cross-head reaches the extreme end of its travel. It does not matter which end. Now put the reverse lever in the full forward notch, and with a knife or chisel scratch a mark on the valve stem close to the gland. Then get the fireman to pull the reverse lever into the full back motion, and watch the mark on the valve stem. If the mark now comes within ¼ inch of the point where it stood in the forward motion, the eccentrics are all right, or at least they are not so far out as to disable the engine. Subject the other side of the engine to a similar examination, which can be done in a few minutes, and the test of the eccentrics is complete.

One precaution is necessary before making this test, viz., to see that the eccentrics have not slipped, so that they occupy the same position on the shaft. In such a case, which the merest inspection would detect, they would each move the valve stem in the same fashion. Finding that the eccentrics are in their proper position, the next step would be to ascertain which of the valves was at fault, for there the trouble must be. To do so, place the crank-pin on the quarter, with the cross-head in the middle of the guides. Open the cylinder cocks and apply a little steam. Move the reverse lever from forward to back gear, and, if the steam keeps blowing out at one end of the cylinder only, that side is out, for the rocker does not move the valve. Where a valve yoke is broken, the valve will be pushed to the forward end of the seat, and the back cylinder cock alone will emit steam, no matter what may be the position of the crank. Sometimes both cylinder cocks and exhaust show steam, which indicates that the valve is raised from the seat, a condition often brought about by a broken yoke.

Difficulty in distinguishing what is causing trouble with the valve motion is not always confined to mechanical novices. Men of mature experience sometimes get grievously deceived, especially when they jump at conclusions. Engineer Daly, who had been long enough at the throttle to be running a passenger engine, got badly left in this way. In trying to start from a station, the steam roared through the exhaust with the sound which indicates an accident that permits the live steam to pass into the exhaust port. "A broken valve yoke" was the immediate conclusion arrived at by Daly, and without a moment's loss of time he disconnected the engine. After the valve stem was disconnected, he found there was no blow; so he went on with one side, congratulating himself all the while at not wasting time over useless investigation. At the end of the division there was no means of repairing the accident, and the engineer asked for and obtained leave to return light to headquarters. Just before starting Daly met an old engineer, to whom he mentioned the mishap that had befallen his engine, and this old engineer ventured the opinion that nothing more than a cocked valve had been the matter. This led to the raising of the steam chest, which showed that nothing was wrong. The valve connection was of the kind where a T-shaped yoke fits a slot on top of the valve. Under certain circumstances, this valve will get jerked off the seat. It will happen most readily when running at a high rate of speed without steam.

This same Daly—an impulsive, mercurial sort of fellow, whom nature had intended for a Congressman, or some other calling where reflective judgment was not necessary as a means of success—distinguished himself on another occasion by turning a simple mishap into a means of half disabling the engine. One morning he took out a strange engine, which was an odd one on the road, with boiler-head cocks that opened and shut the opposite way to those on the standard engines. When he started out, the heater cock was slightly open, and presently, wishing to commence pumping water, he turned the heater cock with the intention of shutting it. But, instead of doing so, he opened the valve, letting a full force of steam into the feed pipe. So the pump would not start, and, after striving for a little while to get the water through the pipes, he fell back upon the injector. But the injector was not powerful enough to supply sufficient water to keep the train going, and he had to wait at stations several times till the boiler filled up enough to last to the next stopping place. And the heater worked so strong that the hose had to be loosened up to let the steam escape, otherwise it would have heated the water beyond the working temperature of the injector. But Daly went along in child-like confidence that the thread of the heater stem was stripped; and his mistake was discovered by a machinist at the end of the division, after the engine had run one hundred and sixty miles, and lost forty minutes of express time.



IMPROVED UPRIGHT DRILL.

Improved Upright Drill.

When our attention is attracted in the direction of drill presses, this question naturally suggests itself: What will be the next step taken toward improving the modern drill press? We at once begin a discussion of the merits of the best drill presses in use, and endeavor to define their imperfections, with a view of overcoming any objections.

Almost any ordinary drill press can be made to work upon a general class of work, but there are various branches of the machine business in which it has been found advantageous to have a drill press with a more extensive and quick vertical adjustment of the spindle than obtains upon drill presses of the old construction. This is one of the features of the drill press shown in the accompanying engraving. It is made by Currier & Snyder, 131 Central street, Worcester, Mass.

The spindle of this machine has a continuous vertical movement of 24", and can be fed automatically the entire distance. It is also provided with a quick return motion, so that the head can be quickly adjusted to feed at all positions within the distance previously specified.

To secure these advantages, there is a rack upon the column, from which power is derived by means of a pinion attached to one end of a shaft, and a worm wheel attached to the other end. This worm wheel, instead of being disconnected, as in common practice, to permit an adjustment of the head, is connected and disconnected with the pinion shaft by means of a clutch This clutch is conveniently operated by pulling out and pressing in the hand lever shown at the left side of press. By pressing in the worm gear is disconnected with the shaft, which allows the spindle to be quickly adjusted to any desired position without the use of bolts; then, by pulling out the lever, the drill may be fed by turning the hand wheel, or by the automatic feed.

The feeding mechanism is very simple, being of the friction type, and is thrown in or out of use by simply turning a milled nut at the center of the hand wheel. The feed cone upon the top shaft is made loose upon the shaft, so that when the automatic feed is not required this cone can be disconnected from the shaft by shifting a thumb-nut similar to that used upon the cones of lathes. With this device the feed mechanism, when not in use, remains stationary without throwing off the belt. It will be observed that the back-gear shaft is well supported by a bearing at both ends. The top shaft is also well supported, having a third bearing near the middle.

The sliding bearing for the head upon the column is 7¼" wide, which is very large for the work it has to do, having large wearing surfaces. All lost motion may be readily taken up by a gib and screws. The length of bearing upon the head is 12".

The bearing for the spindle through the head is 1⅞" in diameter, being made similar to those used for the head spindle of engine lathes, and is provided with suitable means for taking up wear. The spindle proper is 1¾" in diameter. The manner in which the holes through the boxes for spindle as well as the hole for table are bored, insures a perfect alignment, which is certain to bring all parts square when finally put together. There are no slots or holes in the table, as a separate cast-iron plate is intended to be used upon the face of table to preserve the surface, which would otherwise be subject to more or less damage through carelessness.

The point of the drill in use upon this press always remains the same distance from the head, consequently it is equally well supported in all positions.

It will be observed that the face of the column does not project, so as to interfere with the swinging of large work upon the table.

The base and column are of large proportions, likewise the back brace, which is of one solid piece. The latter weighs more than two hundred pounds, the total weight of complete drill press being 1,900 pounds. It will swing 24". The greatest distance from the base to spindle is 52", while the greatest distance from table to spindle is 40". Vertical movement of table is 22". Bearing of table upon top of support is 7" in diameter. The cones are proportioned for a belt 3" wide, and the distance between them admits of long belts, the advantages of which are well understood. The driving pulleys are 12" in diameter, with 4" face each. Each of these presses is tested in practical use before it leaves the shop.

Wilkinson's Positive Combination Clutch.

This is a combination of the friction cone and the positive clutch coupling, with new features in both, and so arranged that the positive clutch can be engaged while running at full speed without the slightest shock. Wherever the old positive clutch is used, it is necessary to retard the speed of the shaft before the engagement can be made, and then it is a difficult matter, and what is worse, the shock of an instantaneous connection tends to destroy a line of shafting, or other machinery to which it may be applied.

By this invention the momentum is obtained by the friction cone, after which the clutch engagement is made without jar, making a positive connection by the means of friction, or if it is desirable to run by friction alone, the cone can be so adjusted that the least strain over the desired load will cause it to slip.

The two views of this clutch are both the same in principle, the only difference being, that in Fig. 1, the hub of the friction drum *D*, is cast long enough to accommodate the wheel for driving the bucket belts of grain elevators, trains of rolls, &c., while in Fig. 2, shown in section, there is a belt rim cast on the periphery of the drum, *d*, converting it into a friction pulley, the hubs of which are confined between the collars *s* and *v*. The inner hub, *t*, is made long enough to reach into the annular groove, *g*, so that the escaping oil is thrown by centrifugal force to the bottom of the groove, and out of the oil-hole, thus preventing the surface of the friction cone from being lubricated.

In Fig. 1, the periphery of the drum, *D*, is broken away to show the paper wads inserted into the face of the cone, which is done by drilling perforations the depth of the material—thick mill-board—which gives a very adhesive frictional surface.

The lugs, *M*, (which are beveled to facilitate engagement) pass through openings in the disk of the drum, *D*, into corresponding ones in the cone, *G*. It will be observed that the short sides of the lugs *M*, are long enough to pass through the disk of *D*, and into the apertures of the cone, *G*, sufficiently to give a solid bearing, so that the shaft can be turned backwards if necessary.

The operation is very simple. The cone is first forced into the drum by the shipping gear, which gradually imparts the motion of the driving to the driven shaft, when the clutch is forced in until the ends of the lugs press against the face of the cone. The friction side is now slackened a little to allow the cone to gain on the clutch, the inclined ends of which glide along the edge of the recess (as seen in Fig. 1,) until the long end abuts against the opposite or driving end. It now only remains to force the clutch to its destination, into which it is snugly fitted, preventing the slightest backlash. This clutch is the invention of E. Wilkinson, 276 Ellison street, Paterson, N. J.

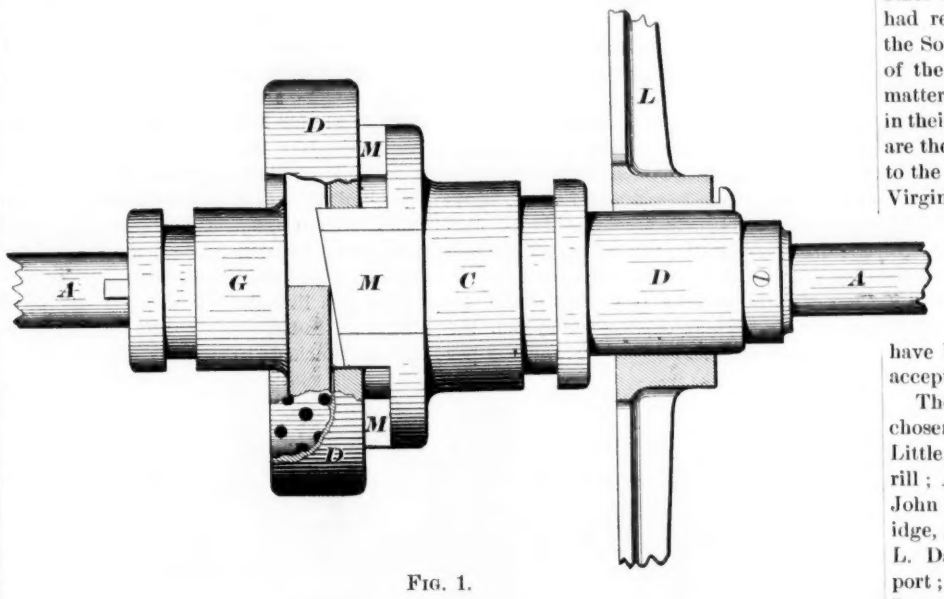


FIG. 1.

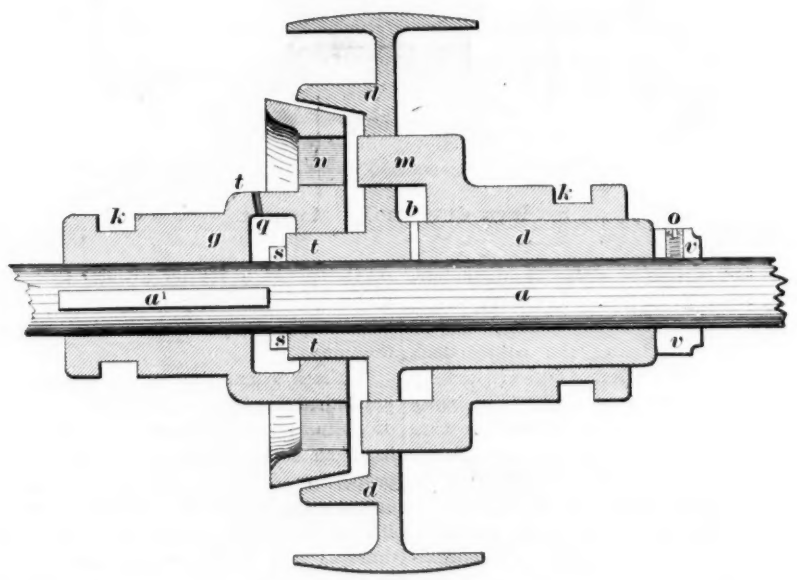


FIG. 2.

An Apparent Anomaly.

It is generally considered that the attempt to utilize heat from the gases after they leave the heating surface of the boiler has the effect of decreasing the draught of the chimney, and that it will prove the reverse of economical in generating steam for a definite purpose, such as for use in a steam engine, unless this heat is in some way applied directly to the purpose of assisting in generating the steam used, or for decreasing the quantity of steam required. As, for instance, it is sometimes used for heating the feed water, when the effect is substantially the same as lengthening the heating surface of the boiler, or it is used for re-heating the steam between the cylinders of a compound engine, thus effecting a saving in the steam required. In an instance that has come under our notice the opposite of this seems to be true, the escaping gases at a moderate temperature being utilized to superheat the exhaust steam from the engine, the apparent result being a less consumption of coal to run the engine than when the gases are discharged directly into the chimney. It is said by those in charge of the boilers that the difference between using a portion of the waste heat for the purpose named, and running without doing so, is plainly noticeable, the boilers doing their work with less damper opening when the super-heating arrangement is in use; also that by actual trial less coal is burned to do an equal amount of work. The exhaust steam is used, as it were, to take up the waste heat and serve as a medium by which to carry it where it is required for heating and drying purposes. The boilers (there are two of them) are of the ordinary type of return tubular set in brick work, and the chimney has only fairly good draught. We expect before long to lay before our readers further particulars in reference to this, and to present the results of careful investigations, made with a view to ascertaining the measure of economy obtained.

An Ingenious Machine.

The New York *Times* says:

"A new machine, operated by clock-work, is to be placed in the train-starter's tower at the Grand Central Station which is designed to do automatically what is now done by men employed as train-starters. The machine, of brass, copper, and steel, occupies but little space, it being less than 2 feet in either length, breadth, or height. The mechanism consists of three upright cylinders of brass, in which are punctured a series of holes, each representing one of the 1,440 minutes in the day. By the side of these are three smaller pillars, on which are fixed spirally pins representing the 24 hours of the day. The three pairs of pillars as they stand in the case represent respectively the three roads using the Grand Central Station, the Harlem, New York Central, and New York, New Haven and Hartford. A series of springs are set so as to be operated upon by the two cylinders as they each in turn, make their revolution in the 24 hours of the day. These springs connect with electrical appliances. The fixed pegs on the hour column and the movable pegs set into the minute cylinder striking the arms of the spring, set the necessary bells ringing in various parts of the station. At 20 minutes before the leaving time of through trains bells are rung for the gates to be open. Fifteen minutes later they ring a warning "all aboard" in the passenger-rooms, and in the baggage-rooms notify the baggage-master to have all his baggage on board the train. At one minute before leaving time they ring to close the doors leading to the station, and they ring a minute later to start the train. All this is done automatically by this ingenious contrivance of clock-work and mechanism, and without the possibility of a mistake unless the clock-work or electrical machinery clogs or breaks. The machinery adjusts itself once in seven days to the fewer trains that run on Sundays, and then readjusts itself for Monday's increased travel. All this signalling is now done by hand, the bells being rung by a system of bell pulls. It is claimed that greater accuracy can be obtained by the use of this contrivance, and much labor saved. Its capabilities will be fully and severely tested in the trial which it will at once receive at the station. There are now 198 trains arriving at and leaving the station each day in the week, except Sundays, when the number is but 48. During the summer the arrivals and departures on week days are increased by about 40 trains."

Affairs of the New England Manufacturers' and Mechanics' Institute.

At the recent annual meeting of the New England Manufacturers' and Mechanics' Institute, the treasurer, John F. Wood, presented a report which showed the total cash receipts to be $399,184.60, of which $36,272.03 was profit on the exhibition. After paying expenses (mainly on construction account) a balance of $3,456 was in the treasury. Compared with last year the indebtedness is little or no greater. Besides paying nearly $40,000 of back bills left over the year previous, improvements and additions of a permanent nature to the extent of $40,000 were reported as having been made. Mr. Wood concludes as follows:

"Of the success of our last exhibition I need not speak, for you all probably saw it, and know that it was pronounced 'a decided success,' but successful as that was, the third annual exhibition bids fair to excel it, and to be in fact a 'national exhibition.' The plans for it were made before the last exhibition ended, and your executive committee met and appointed a committee on conduct of the fair, and authorized them to visit such States, South and West, as they deemed expedient, with a view of interesting the people in a grand national exhibition."

The Secretary, Frederick W. Griffin, reported, among other things, that he and the other representatives of the Institute who had recently made extended tours through the South, found the people in that section of the country deeply in earnest in the matter of interesting the people of the North in their industries and natural wealth. They are therefore becoming enthusiastic in regard to the Institute, and there is no doubt that Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi and Louisiana will be represented at the fair to be held in the fall. Several of the leading railroads of the West and Northwest have been invited, and some of them have accepted the invitation.

The following named gentlemen were chosen as an executive committee: James L. Little, Samuel R. Payson, William B. Merrill; A. D. Lockwood, Providence, R. I.; John F. Wood, F. W. Griffin, A. L. Coolidge, James H. Work, S. A. Woods, George L. Damon; Edward Kendall, Cambridgeport; Henry Mason, John M. Little; W. C. Lovering, Taunton; Theodore C. Bates, Worcester; George Crompton, Worcester; William F. Goulding, Lewiston, Me.; F. C. Kennedy, Burlington, Vt.; Frederick Grinnell, Providence, R. I.; W. E. Barrows, Hartford, Conn.; F. A. Pratt, Hartford, Conn.; P. C. Cheney, Manchester, N. H.; William H. Forbes, Alexander H. Rice, Boston; W. L. Bradley, Boston.

We congratulate the Institute upon its high success thus far, and its brilliant outlook for the future.

The publishers of the *Engineering News* of New York City announce that they will publish on or about April 15th the first number of the *Engineering News Quarterly*. Each number will contain 96 pages and will be profusely illustrated. It is said in the publishers' announcement: "In its range for subject matter treated upon, the *Quarterly* is intended for engineers of all 'denominations,' and whatever is new in civil engineering in all its varied branches, hydraulic mining, hydrographical, or surveying, in military, naval or electric science, will find a place within its ample pages." The subscription price will be $4 a year, or $1.25 for each single number.

Iron failures come and iron booms go, but the Akron Iron Company's works run on night and day.—*Akron (O.) News.*

The New Jersey Assembly has passed the bill providing for the taxation of the property of railroads, and other corporations, on the same basis as that of private individuals.

A coal dealer makes money when he has his own weigh.—*Boston Bulletin.*

As an evidence of the advantages to the farmer of improved machinery, it may be noted that it requires only one-fifth of the time to sow, reap and thrash an acre of wheat that was required by the old-time methods.

Petroleum Fuel in a Rolling Mill.

The Boston *Commercial Bulletin* says:

"The Norway Iron Works, at South Boston, after years of experimenting, believe they have succeeded in so simplifying and cheapening the process of using petroleum that it is preferable to the usual system of heating with gaseous or solid fuel. The petroleum is forced into a cast-iron tank, which contains a receptacle to which a large surface has been given by alternate contraction and swelling of the section by deep corrugation. Upon the surface of this interior receptacle the petroleum drops in a small stream. Through the interior of the corrugated receptacle passes live steam, which issues from an orifice in the bottom in a superheated condition, mixing with the vaporized oil. The entire cylindrical tank is heated by a special fireplace, and the mixture of superheated steam and vaporized petroleum is directly carried to the furnaces where it is used.

"Oil has recently been introduced to run a scrap heating furnace, in which the two ton charges are put through in twenty-five or thirty minutes. Near this is a double puddling furnace, also heated with oil, it having a capacity of from 12,000 to 15,000 pounds of pig, from four to five heats got out of the furnace per ton hour shift, or more than two single ordinary puddling furnaces near by, with a capacity of from 472 to 500 pounds of pig each. All of these furnaces are worked more for high quality than for large production. A third furnace heated with oil is used for reheating open-hearth steel ingots."

The railroad bill, which has passed one branch of the Nebraska legislature, prohibits special rates and discrimination under severe penalties; requires railroads to furnish all patrons equal facilities; and requires all connecting roads to deliver, handle, and transport freight coming from rival lines with dispatch. It requires railroads to keep freight and passenger rates posted in all their stations. The maximum rate for all freight is fixed at 20 per cent. below the schedule rate in force January 1 of this year. Passenger rates on all roads are fixed at 3 cents per mile, including 100 pounds of baggage, and the rates for children under 12 years at half fare. The bill also regulates the handling of live stock and grain, and requires roads to give ample facilities to all shippers.

A correspondent of the New York *Evening Post* in discussing the reformatory effect of prisons upon convicts where the private contract system of labor is carried out, makes the following pertinent inquiry: "How high an estimate will criminals put upon the dignity and power of government when they see that their own punishment for disobedience of the regulations of that government is made a source of private emolument?"

Six-Inch Cutting-Off Machine.

As is well known with manufacturers, cutting off stock of iron, steel and other metals constitutes a large share of the blacksmith work of a machine shop, and, when performed in the usual manner, costs three times as much as if done in a properly designed machine.

Much ingenuity and thought have been expended upon machines of this character within the last few years, and to show how they are appreciated it is only necessary to point to the number of such tools that have been sold. In fact, almost all first-class shops are now using one or more of them.

The ordinary mode of cutting off consists of three operations: heating, cutting with chisels, and finishing the ends afterwards Either of these operations costs as much as to cut off by a machine which performs the work all at once.

It is not necessary to have skilled workmen to operate the machine, as the tools require no dressing, and any one, with a little practice, can soon learn to grind them.

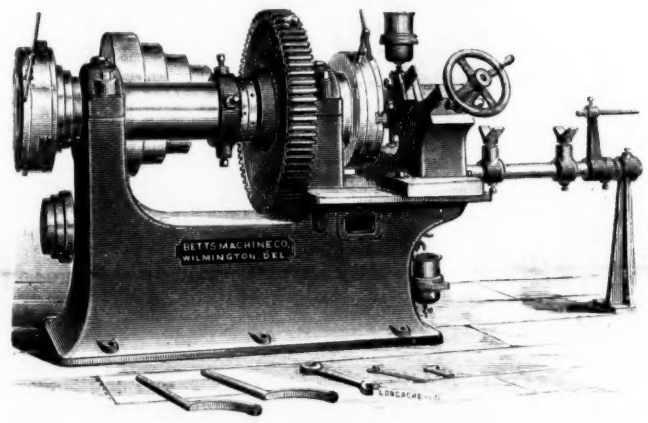
The machine we illustrate on this page has capacity to cut up to six inches in diameter. It has been brought out by the Betts Machine Co., Wilmington, Del., who have already made machines of 4 in., 2½ in., and 1½ in. capacity. It is worthy of note that the first order for this size machine came from works outside of the United States.

The machine is powerfully geared; has a hollow spindle, with concentric chuck on each end of it, so as to get a firm grip on the bar; and a special tool clamp, having an adjustment to alter the angle of the cutting edge of the tool, which was designed by the makers of this machine. The feed is, of course, automatic and adjustable. Gauge rods, for cutting to length, and catch castings, for the pieces cut off, are furnished.

Machine Tools—Countershafts.

By Oberlin Smith.

Machine tools are a promising subject for reform, being now in a condition of chaos dire. The chief evil in regard to them is an utter lack of system and uniformity in the matter of *speed*. To illustrate this point: there are, in a rather well-organized machine shop, a few yards from where I write, 16 engine lathes and 18 or 20 other machines—planers, drill-presses, etc., etc. These tools are all speeded so that, on suitably sized work, their cutting velocity is from 20 to 25 feet per minute. Their driving pulleys on the main shafting (running 200 revolutions per minute) are of eleven different diameters, varying from 5″ to 24″. There are among them some sixteen different widths, from 2″ to 15″. In calculating the countershaft speeds, those for the different lathes (which, by the way, do not vary very much in size, being most of them from 10″ to 22″ swing) were found to be respectively as follows: 75, 88, 112, 86, 79, 183, 124, 95 and 100—some of the sixteen being duplicates of these numbers. The speeds for the other machines varied in still greater degree. To approximately obtain these speeds a number of the pulleys had to be of such odd sizes as 5″, 7″, 21″, 13″, etc.



Six-Inch Cutting-Off Machine.

It does not need much argument to prove that this state of things is a nuisance, and that it would be much better if a set of machine-tools could be driven by pulleys of but one, two, or at most, three different diameters. I am not, without further research, prepared to express a positive opinion as to the best main-shaft speed or best driving-pulley diameter for the average machine shop. As countershafts are *now* made, a speed of 200 revolutions per minute is probably as good as any. A much faster speed than this necessitates pulleys of too small diameter for good belt contact. It is, of course, better to have it a "round number"—say a multiple of 50 or, if possible, of 100—for convenience in calculating. When the machine-tool makers and users shall agree upon a standard in this matter, it will very likely be found that a speed of either 300 or 400 will upon the whole be best. The principal object of thus increasing shafting speed will be to obtain a faster belt speed (to the countershafts) without using very large pulleys. Of course there is also a decided advantage in being able to use smaller shafts, with consequent cheaper first cost and operating expenditure.

In this day of mechanical civilization it would seem hardly necessary to urge the advantages of high belt speed, *per se*. And yet we need not travel "twelve miles from a lemon" to find shops where rheumatic shafting goes squeaking and groaning on its weary round, strained to its utmost by stiff, wide belts whose extreme tightness, aided by copious pourings on of rosin and tallow salve, fails still to make them transmit the required power, while creeping along at perhaps 200 feet per minute. The foreman in such a shop wonders what's the matter. The proprietor doesn't know that there *is* anything the matter. It has never yet entered either of their heads that "power" is a product of time and space, as well as pressure. The latter alone (mixed with a good deal of rosin) seems to them all sufficient. In marked contrast to this state of things is the modern practice in our best cotton mills, where some of the belts run at a speed of over a mile a minute. At such velocities it would be an easy matter to run a small machine shop with a 1″ belt, or even a piece of clothes-line! In belting to countershafts, however, we must adopt a compromise between these extremes of speed, and must limit the velocity of our belts so as to avoid such a momentum in the countershaft pulleys as will prevent their stopping quickly when the belt is shifted. Keeping within this limitation (which, by the way, may be extended considerably by the use of brakes attached to the shipper rods, as mentioned in a former article) there is no mundane reason why countershafts should not run with very much faster belt speeds than now.

Without attempting to fix upon the best possible arrangement for driving a room full of ordinary machine tools—say lathes swinging from 10″ to 50″, and other machines in proportion—let us imagine such a shop with one or more lines of 2″ shafting, running at 400 revolutions per minute, carrying driving pulleys with a uniform diameter of 12″. Suppose the makers of all the tools had agreed upon a standard of 200 per minute for their countershafts and 24″ for the diameter of the driven pulleys thereon. These pulleys would be very narrow and could be made extremely light. The belts, most of them, would be either 1″, 1½″ or 2″ wide and would run at a speed of about 1200 per minute. They should be run at rather a loose tension and should be long—say from 8 to 12 feet between pulley centers. Belts arranged thus could be so instantly shifted that the delicate and expensive structure yclept a "friction-clutch" (wherein the object seems to be to "store up" as much friction as possible, in all directions except a circumferential one) would, Othello like, find its occupation gone. Scarce any engineer will doubt that this arrangement would be cheaper, more convenient and less power-absorbing than the present conglomerate system, with its wide, tight belts running at any speed at all that does not transcend a fulfilment of the destiny marked out for them—to "go slow." As before intimated, however, the above proportions may not be the very best. Quite possibly a main shaft running at only 300, with pulleys 16″ instead of 12″, would on the whole be better. There would, on the one hand, be the advantage of longer arcs of contact for the belts (both angular and circumferential) and, on the other, less torsional strain upon the shafting. One incidental advantage of high belt velocities that should not be forgotten is the reduced lateral pressure upon shafting, owing to the narrower belts.

Regarding the construction of countershafts themselves there is certainly much room for improvement. One very common fault found in them is being too *short*. Another is being "shouldered down" at the journals, so that the hangers can have but one position. Another is lack of uniformity in size. Apropos of the first mentioned; it will often be found in arranging a somewhat crowded shop, especially if the line-shafting is scant in quantity, that some of the countershafts must be lengthened out by welding in a piece—a not very agreeable operation. The ridiculous practice of cutting down the journals to a smaller size than the body of the shaft, particularly if the pulleys run against other fixed shoulders, is a source of great annoyance in putting up the hangers—not only because their rough adjustment upon their timbers must be to an exact position to suit the machine below, but that their distance apart must be delicately arranged to "collar" (if I may use such a verb) the shaft endwise. The other evil mentioned, lack of uniformity, is one of those things that must wait for the much-to-be-hoped-for *concurrent action* among tool builders.

The cheap, convenient and common-sense system for these shafts is to make them perfectly straight and plain, like any other piece of shafting, and of length somewhat in excess of their probable need. They should, of course, be of some of the diameters which have become almost standard in this country—viz., $1\frac{3}{16}''$, $1\frac{7}{16}''$, $1\frac{11}{16}''$, etc.—in order that regular commercial pulleys may fit if required. For all small and medium machine-tools an excellent and practical standard for diameter would be $1\frac{7}{16}''$, and for length, 4 feet. The latter might be varied to 3, 5 or 6 feet, according to circumstances. The shaft should be held in position lengthwise by two loose collars—one on each side of *one* of the hangers, in order that there may be neither "play" nor "bind" if a hanger shifts a little by the springing or shrinkage of its wooden supports. Where there are loose pulleys there should be other loose collars to confine them in place. By this system a pair of counter-hangers can be put approximately in position and their journal-boxes "lined up," level and parallel to main shafting, without danger of being afterwards displaced by having to knock them endwise. It is, of course, much easier to line them by putting a straight-edge or an empty shaft through them than it is when the shaft and a lot of pulleys (probably all of different sizes) have to be put up *with* them.

The difference between the two systems in the matter of putting up and taking down is very considerable, it being vastly easier to stick a shaft, in a nearly balanced position, through one of the journal-boxes and then "string on" the pulleys, one at a time, than it is to hoist the whole concern to exactly the right height and position and then move the hanger endwise on it. If any reader doubts the truth of this statement, let him examine the broken-pulley account and the profane-swearage account of two shop-owners who have respectively practiced the different systems. Or let him undertake to transpose a couple of lathes some night before he goes home to his supper and the bosom of his family.

Finally, there is no earthly reason, except a clannish want of public spirit, why the machine-tool builders of the United States should not agree upon some few standard points in their machines and the countershafts therefor. Surely their products are worthy of as scientific and systematic a treatment as those of the master car builders, the stamped-ware manufacturers or the stove men. Will the American Society of Mechanical Engineers do anything in this important matter? If not, why not?

50-Inch Chucking Lathe.

In the AMERICAN MACHINIST of January 13, 1883, in illustrating a system of working drawings, we showed some of the details of a 24-inch chucking lathe, built by A. M. Powell & Co., Worcester, Mass. We illustrate with this a 50-inch chucking lathe made by the same firm, and which is of new design, combining several important features. It is made especially for chucking holes in pulleys, gear wheels, couplings, and similar work.

The gap can be entirely closed, when the swing will be 25 inches, and the greatest distance between the centers 3 feet. When the gap is opened the swing is 54 inches, and when opened to the full distance (2 feet) the greatest distance between centers is 5 feet.

The tail spindle has quick return motion, and may be traversed, by hand or power, a distance of 17 inches.

An attachment for boring and turning, not shown, is provided when required, by using which the full swing of the gap, 54 inches, and 24-inch face, can be turned.

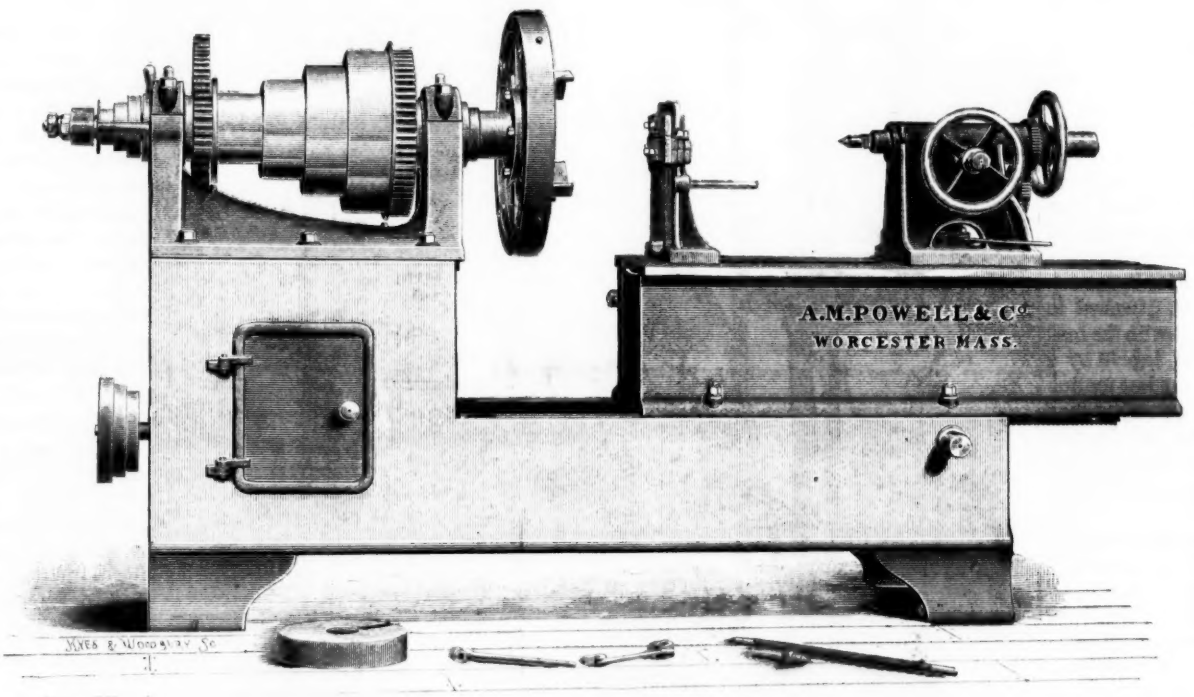
Large face plates and other appliances can be furnished with the machine.

The cone is large, and bearings long and large. The weight of machine, with 7-foot bed, is 3,600 lbs.

Rufus Brown, an unsophisticated Vermonter, accidentally broke the griddle on which flapjacks for the family were baked. He got a two-inch board and marked out the size of the broken utensil and sent it to a foundry to have one made, supposing they would "thin it down." When he went to get it, he was amazed to find it weighed 60 pounds.

As Mexico becomes better known, through being opened up to commerce by the completion and projection of railway lines, the natural advantages of the country are better appreciated.

It is now said that there is no country in the world that equals it in the abundance and variety of fibrous plants, which can be utilized in paper making.



FIFTY-INCH GAP CHUCKING MACHINE.

To Turn a Shaft Properly.

BY JOHN J. GRANT.

REPRINTED FROM THE AMERICAN MACHINIST OF DECEMBER, 1878.

In the October issue of the AMERICAN MACHINIST I described the proper method of preparing a shaft for turning; the next thing is to see that we have the proper tools and appliances for so doing.

Any good lathe of sufficient length will answer our purpose, but it is necessary, in order to accomplish a large amount of work, to construct a special fixture or rest to be bolted to the sliding carriage.

The rest should be heavy and strong, and bolted to the right-hand side of the carriage, having a cylindrical aperture, at least one inch larger than the largest shaft necessary to turn, and on a line with the centers; this should be doweled on to the carriage to allow it to be put on again after removing in exactly the same position, and should also be bored out with a bar when in its place.

Rings of either cast iron or hardened steel having a hole of $\frac{1}{100}$ inch larger diameter than the shaft to be turned are fitted to the rest and held in place by a set screw; the ring of this diameter is calculated for using a "doctor," or scraping tool at the rear end, and is bored out $\frac{1}{100}$ in. larger, to allow the doctor to take a finishing chip; when a doctor is used at the front end only, the ring should be of the exact size of the finished shaft.

At both ends of the rest a place should be planed in about 1 inch wide and $\frac{3}{8}$ inch deep at an angle of 45° from the horizontal line drawn through the center of the rest and on the front side, to receive the "doctors" or scraping tools; these tools may have a slot in them, and be held in with a collar-head screw. Lugs cast on the rest, and standing out over the doctors, have set screws tapped into them to back up and set them down to their work.

There should also be two diamond-point turning tools, one in front for removing the greater part of the stock, and the other for a light chip, and to take any that may be left from the first tool becoming dull. A good plan is to turn one end of the shaft the exact size for about six inches in length without the rest, as it facilitates the setting of tools, and when a large number of shafts are to be turned of the same size, one setting of the doctors is all that is necessary.

Having the rest properly constructed, and the shaft having been turned for a short distance on the end, place the shaft in the lathe, properly dogged, and while it is revolving, adjust the doctor at the front end to slightly scrape the finished part of the shaft. Care must be taken not to get the shaft too small in the ring, as it will not turn round, and the doctor at the rear end will chatter. Adjust the diamond-point tools to take a thin chip and start the feed; have a ring or templet the size of the finished shaft, and as soon as the shaft comes through the ring adjust the doctor at the rear end to cut to exactly the finished size, as shafting turned in this way requires no filing, and will come out very accurate and smooth. All the tools should be thoroughly lubricated with soda water, and occasionally a little oil applied to the ring. Care must be taken not to let the shaft become too large for the ring, as it will heat and stick.

With the proper tools and a rest, constructed as described, from 100 to 150 feet of 2-inch shafting can be turned in a day of ten hours.

After the shaft is turned it will be found to be sprung, and will have to be re-straightened, which can generally be done easily with a bar and a rest for a fulcrum; sometimes, however, it will be found necessary to pean it, which should be done by laying a thin piece of brass over the shaft and using a medium heavy hand-hammer, and giving it a smart blow, at the same time having a helper spring the shaft up with the bar. Your shaft is now ready to polish, which should be done either with nicely-fitted wood or lead clamps made with a hinge at one end, like a butcher's scrap-squeezer; never saw a V notch in them, as I have often seen done, but fit them around the shaft nicely. Use emery and plenty of oil or strong soap-suds, or soft soap, and the shaft is done. When it is necessary to turn a shaft in a lathe which has no follower-rest constructed as described, a center or steady rest (sometimes erroneously called a back-rest), may be used. In conjunction with the center rest a fixture called a "cat-head," made in the following manner, is used: Take a cylindrical casting about 8 inches long, 4 inches in diameter with a hole of $2\frac{1}{4}$ inches diameter through it. At each end put three set-screws long enough to reach within $\frac{1}{16}$ an inch of the center, and you have a cat-head suitable for a 2-inch shaft, and smaller.

This fixture should be put upon the shaft, enough out of the middle to allow the shaft to be turned far enough, so that when the shaft is reversed end for end the finished part will run in the rest. By so doing, the rest can remain in the same position until the shaft is finished and the cat-head can be removed, allowing the finished shaft to run in the jaws of the center rest.

The cat-head must be adjusted to run perfectly true, and the rest put in position, and the jaws brought to bear uniformly around it. Only one diamond-point tool can be used when a shaft is turned in this manner, and it is generally necessary to run over the shaft twice; the first time should take most of the stock, and the next chip should be taken with a tool a little flat on the end, and set to drag after the manner of a scraping tool. It will be found that the shaft is sprung after turning, and must be made straight again before the other half is turned or an offset will be formed. Turn the shaft as near as possible to the size required, as the less filing done to any shaft or spindle the better.

Use a float or mill-saw file, and use a ring or templet to file to; after the filing, be sure the shaft is straight. Polish with the same kind of clamps as before. Twenty or twenty-five feet of 2-inch shafting turned and finished in this manner is a good day's work. In all cases look well to your centers, and keep them well oiled. If the centers wear out of true you can never make a satisfactory job, and always remember—quality before quantity—for you can never turn out a poor job but sometime or other it will, like a bad penny, return.

Wire Rope Transmission.

(FROM THE "GRAIN CLEANER.")

Wire ropes for transmitting power are manufactured of iron, steel or copper, as desired, and always with a hemp center or core to increase the pliability, their range in size being small, varying only from three-eighths to seven-eighths inch in diameter for three to three hundred horse power. For the smaller powers it is advisable to use a size full large to increase their wearing capacity; but it must be remembered that a large rope is stiffer than a small one, and that more power is lost in bending it around the wheel. A seven-eighth rope having the same velocity as a three-quarter rope, transmits less power, simply because of its greater stiffness.

The wheels should be made of cast iron, accurately balanced, with a stout hub and a deep flaring groove, the depth and width of groove depending much on the length of span, and whether or not the rope be subjected to side winds. The rope must run on a cushion of soft wood, oakum, rubber or leather; the last two mentioned are best, and are cut into pieces of proper shape to be driven into and fit the bottom of the groove that has been so made as to prevent the filling from flying out. The rope runs on such a cushion without any noise or slipping whatever, soon fitting a small round groove to itself, and is capable of running usually from two to five years, when a new rope can be supplied at trifling expense.

At the point where belting becomes too long, the wire rope is properly the transmitting medium, and may be employed even miles in length. When, however, the distance materially exceeds 350 or 400 feet, intermediate stations should be erected, mounted by double-grooved wheels, by that means dividing a long, continuous and heavy rope into two or more short, endless ropes, extending from station to station. The stations should be of nearly equal distance apart, but not so near one another as to prevent the proper tension of rope. Single pulleys are, however, now much used for the intermediate stations, and, we believe, to good advantage, there being but one endless rope in the whole distance. Special care should be observed in getting the axles and journal-boxes well adjusted, and in having a solid foundation reaching below frost, when the loss of power from friction of journal and air, with the bending of rope also, need not exceed twelve per cent. per mile, while the cost will fall below seven per cent. of the shafting. Whenever the distance is less than eighty feet, it becomes necessary to stretch the rope very tight, as the sag cannot be depended upon for the required amount of tension; in such cases the rope should be one or two sizes larger, and the maximum velocity maintained. Should the distance exceed 450 feet, with no opportunity for an intermediate station, the rope in this case should also be one size larger than would otherwise be required. In such cases it is also advisable to take up the slack or stretch at the end of two or three months; although the stretch is comparatively little, it is well to have them full tight at first, when, after some running, they will adjust themselves to the necessary tension.

When it can be so arranged, it is advisable to have the upper side of rope the follower or slack side, and the lower rope the tight or pulling side. Obstructions may thus be often avoided, besides affording the rope more surface on the grooves; but the upper rope should under no circumstances be allowed to become so slack as to swing upon the lower rope. The possibility of such occurrence would be increased by the adoption of small wheels, but should with ordinary care and watching give little or no difficulty.

As to the size of grooved wheels, where there should a choice occur between a small wheel of high velocity and a large one with a slower speed, the larger one should be preferred, since it both further separates the rope and diminishes the loss of power arising from the more abrupt curvature of the small wheel.

Elliott's Improved Drill Press.

We present herewith engravings of an improved drill press for the rapid drilling of small duplicate pieces, and for the centering of lathe work. Besides this it is calculated to perform a miscellaneous class of light work.

It is capable of boring with accuracy holes of all diameters from $\frac{1}{32}$ inch up to $\frac{3}{4}$ inch, one chuck attached to the spindle being adapted for holding each of these sizes.

This chuck is furnished without additional cost above the price of the press, and is considered a part of the same.

The feed lever is so situated that the workman has full control of his work, and should occasion require it the belt shipper may be moved by the foot while both hands of the operator are engaged. The drill is lifted out of the work by a spring, so that it is impossible for the drill to drop and catch upon the work. This will be better understood by the sectional view through the cone. The steel spindle *C*, is one inch in diameter and 19″ long with the chuck *D* attached to its lower end. This spindle is neatly fitted to the bearings *A*, *A*, which are lined with babbitt metal, as shown at *O*, *O*. The spindle is compelled to revolve with the cone *B*, being driven by the balanced driver *H*. One end of this driver comes in contact with the rod *I*, so that while the spindle revolves with the cone it is also free to move up and down. The spindle is held up by the spring *J*, placed between the bottom of the cone and the driver *H*. The collar *N*, is used as a stop to govern the working depth of drills or counterbores.

The weight of spindle and cone rests upon the raw-hide collar *K*, placed within a brass collar *L*, having a lip at its edge to retain the oil used for lubricating the lower box. The power required to feed the drill is communicated through the arms *G*, *G*, attached to the collar *E*, of a lever connected with the feed lever. The adjustable collar *F*, is held by a screw, and is used for taking up lost motion as the raw hide collar wears away. The latter takes the thrust of the spindle and feed lever. The table may be turned about its own center and will also swing around the column.

The center of the table is bored true, and is fitted with a hollow as well as a pointed center. These may be made to move precisely in line with the spindle by means of a spring pin which fits into a slot at the side of the column as shown. The distance between the table and chuck is 26″, and all kinds of work up to this length can be centered in this press with a reasonable degree of accuracy. Entire height of this press is 5′ 4″, diameter of column 3½″, stroke of drill spindle 3″, greatest space between table and chuck 26″, diameter of large end of cones 8″, of small ends 3″, diameter of tight and loose pulleys 6″, width of face 2½″, weight of drill press 250 pounds. The parts of this press are made interchangeable, and the adjustable bearings are fitted up by the aid of special tools. All spindles and shafts are of steel.

It is made by Sterling Elliott, Newton, Mass.

A great many very flourishing business enterprises exist upon the mistakes or wastefulness of others. Here is an instance:

A cotton mill in Georgia uses for its raw material the waste that is gathered from other mills, and from this waste is turned out a product in threads and twines that is fully equal to those made by mills using cotton as it comes from the gin.

One of the most notable features of modern industrial progress is the utilization of what has always been considered waste material. This is usually done by devising and constructing special machinery to meet the end in view. Sometimes costly experiments are necessary, but in this progressive age those who gain the prizes offered by successful business are the individuals who are willing to make ventures involving large risks.

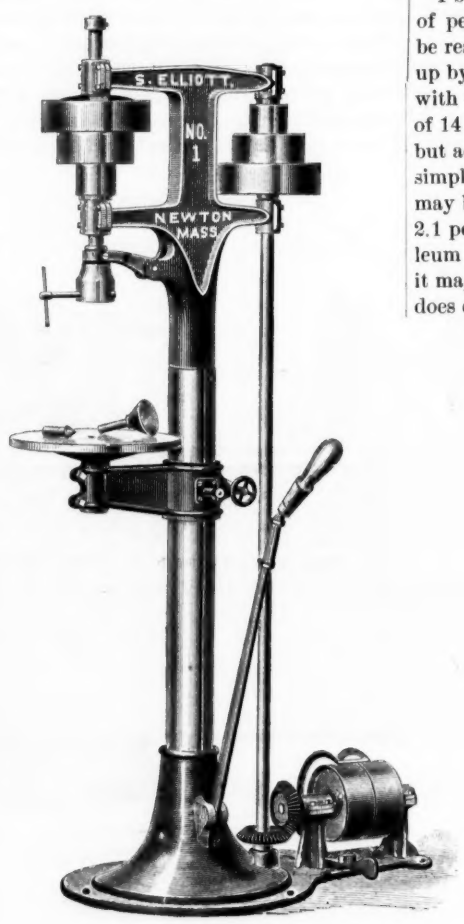
LETTERS FROM PRACTICAL MEN.

Petroleum as Fuel.

Editor American Machinist:

I regret that Mr. W. Barnet Le Van's letter in your issue of Feb. 24, in reply to my criticism in the issue of Feb. 3 of his previous letter, makes it necessary that I should further reply to him in order that your readers may not be misled by his argument in favor of petroleum as fuel.

I quote from his letter: "*Second*, good merchantable coal, properly burned, should produce 13,000 units of heat instead of 10,000, as Mr. Le Van says. According to the report of the tests of steam boilers at the international exhibition of 1876 * * the units of heat produced by the combustion of one pound of good coal averaged 10,151." Mr. Le Van is wrong. The figure 10,151 may have been the number of heat units *absorbed* by the boilers per pound of coal burned, but the amount *produced* by the coal was about 30 per cent. greater than this, the difference being the amount of heat



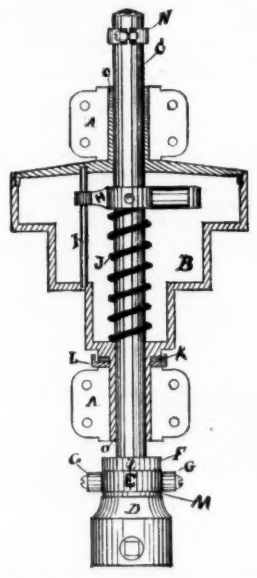
New Drill Press.

lost in the chimney gases and by radiation. Mr. Le Van knows that one pound of carbon perfectly burned produces 14,500 heat units, and as good anthracite should contain about 90 per cent. carbon, it should *produce* 13,000 heat units, as I stated.

Since the Centennial boiler tests are referred to, I may state that I figure the average evaporation, in the economy tests, of fourteen boilers fired with anthracite coal at 11.052 pounds of water from and at 212° per pound of combustible, which, taking the theoretical evaporative power of one pound of combustible at 15 pounds of water from and at 212° (14,500 heat units ÷ 966) equals 73.68 per cent. efficiency. The heat units *absorbed by the boilers* per pound of combustible equal $11.052 \times 966 = 10,676$. As the average refuse in the coal was 10.24 per cent., the heat units absorbed per pound of coal would be $10,676 \times (100-10.24) = 9,583$, instead of 10,151, as given by Mr. Le Van. But as the boilers absorbed only 73.68 per cent. of the heat produced, the amount produced was $9583 \div .7368 = 13,006$ heat units—almost exactly the figure I claimed in my former letter.

Now, for the comparison of coal and petroleum, I will not dispute the figures given by Mr. Le Van as the actual amounts of water evaporated per pound of oil, but assume that they are correct, viz., 17.4 pounds of water evaporated per pound of shale oil, 18.02 pounds of water per pound of "Torbane Hill mineral"—"an extremely good result"—or its equivalent of 20.83 pounds of water from and at 212°. Let us assume that this latter figure is what oil can be made to do under favorable circumstances, and, as a fair basis of comparison, place against it what was done in the boilers at the Centennial tests—not the best results, but the average—11.052 pounds of water from and at 212° per pound of combustible, or, deducting refuse, 9.92 pounds per pound of coal. The gain, pound for pound (not dollar for dollar, let it be noted), in favor of oil fuel is $20.83 - 9.92 = 10.91$ and $10.91 \div 9.92 = 110$ per cent. Mr. Le Van makes a somewhat similar calculation, and is more generous towards coal than I have been, and makes the gain in favor of petroleum only 60.23 per cent.; but as if afraid to carry the argument from these figures in pounds to their legitimate conclusion in dollars and cents, which I shall do, he suddenly drops these figures and brings up a locomotive test showing the extraordinary gain in favor of petroleum of 1233.33 per cent.

I believe this gain of 110 per cent. in favor of petroleum is much higher than can ever be realized in regular practice, for it is made up by selecting "an extremely good result" with oil, and comparing it with an average of 14 results, good and bad, with anthracite; but accepting it as a basis of comparison, it simply means that one pound of petroleum may be made to evaporate as much water as 2.1 pounds of coal. If one pound of petroleum costs no more than 2.1 pounds of coal, it may be good economy to use it; but if it does cost more, then it will not pay to use it.



Sectional View of Cone.

The relative prices of petroleum and coal vary widely the world over. In some places oil may be cheap and coal dear, and in others *vice versa*. Taking the price quoted by Mr. Le Van for naptha, 3 cents per gallon, and the weight of a gallon of naptha 7.1 pounds, we have 7.1 pounds of naptha for 3 cents, or a ton of 2,240 pounds of naptha for $9.46. If this ton of naptha is 2.1 times as valuable (or will evaporate 2.1 times as much water) as a ton of coal, then it will replace 2.1 tons of coal at $9.46 ÷ 2.1 = $4.50 per ton. But my recollection of numerous experiments made for the United States navy (I have not the figures at hand) is that petroleum has not been found in experimental tests to be 2.1 times as valuable as coal, pound for pound, but only from 1½ to 1⅞ times as valuable. Taking the higher of these figures, the one ton of oil at $9.46 would replace 1⅞ tons of coal at $9.46 ÷ ⅝ = $5 67 per ton, which is a rather high price for coal in any locality where naptha is as cheap as 3 cents per gallon.

The whole question of coal vs. petroleum as fuel may be condensed into the following brief statement. If there are mechanical appliances in existence by which petroleum can be burned under steam boilers with as great an efficiency as coal is burned (that is, to utilize 75 per cent. of the theoretical heating power), then petroleum is from 1½ to possibly 2 times as valuable, pound for pound, as coal, *and the economy of substituting petroleum for coal as fuel under steam boilers* (other things, as storage, convenience, danger, etc., being equal) *will depend upon the fact whether or not petroleum costs more than from 1½ to 2 times as much per pound as coal.* In the majority of places petroleum does cost very much more than twice as much as coal per pound. But if there should spring up any demand for petroleum as fuel, on account of its near approximation in price to that of coal, that very fact would raise the price of petroleum and tend to check its use.

I will not discuss the locomotive test brought forward by Mr. Le Van, for it is not worthy of discussion. It is not worthy of the name of a test, if the number of pounds of fuel used and the number of pounds of water evaporated by the fuel were not both measured. Mr. Le Van gives no figures of water evaporation, and I am confident that his so-called gain of 1233.33 per cent. in favor of petroleum is utterly unwarranted by the facts.

It is now high time that this question of coal vs. petroleum as fuel were settled, so as to leave no further room for discussion. Repeatedly, within the last fifteen or twenty years, has the question been brought up, and much money has been spent in experiments to solve it. The result of both discussion and experiment has been that petroleum has not yet been accepted as an economical fuel in any place except where petroleum is exceptionally cheap and coal exceptionally dear. The money spent in experiments has led to no financial gain, and the total result of both experiment and discussion has been to convince me that petroleum is not and never will be an economical substitute for coal as fuel on a large scale. Will Mr. Le Van meet squarely the issue I have presented, and either show how it is possible to get any more than from 1½ to 2 times as much evaporation from petroleum as from coal, or how it is possible that petroleum can be a more economical fuel than coal unless its price is not more than 1½ to 2 times as much per pound, or else candidly admit that the position he has taken is untenable?

Coal.

Notes on a Boiler Test.

Editor American Machinist:

I notice in your issue of March 24th a letter from Mr. Geo. N. Comly, calling attention to an alleged error of mine in computing the results of the evaporation test of the Peacedale boilers. There may properly be a deduction made on account of moisture contained in the steam, whatever that amount may be. But your correspondent is very wrong, I believe, in making the deduction for the heat of the water imparted by the injector. Those who are familiar with the action of an injector will not be misled by the error into which he has fallen. Others may, however, be misled by this adverse criticism, and for this reason I wish to make the correction.

Your correspondent forgets that the increased temperature due to the action of the injector is produced by the condensation of steam which adds to the weight of water fed to the boilers as observed on the test. Referring to his figures, the addition of heat raising the temperature from 28° to 81°, or 43 degrees increase, is produced by the addition of about 4 per cent. to the weight of feed water as observed. In other words, the actual amount of feed water supplied to the boilers, instead of being 133,096 lbs. as weighed in the tanks, was in reality, taking the above data, 4 per cent. more or 143,420 lbs., and the evaporation per pound of fuel becomes 9.69 instead of 9.32 as observed. This water, however, is supplied at 81°. The *equivalent* evaporation, reduced to the basis of being supplied at 212°, is exactly the same, whether computed from 9.69 lbs. fed at 81° or from 9.32 lbs. fed at 38°.

There is no occasion for additional proof of the falsity of Mr. Comly's position, but it may be added that I have made tests of boilers first with water supplied by an injector, and then with water supplied by a pump, and obtained the same evaporation per pound of fuel on both.

Geo. H. Barrus.

79 Milk st., Boston, Mass.

Heating Feed Water.

Editor American Machinist:

A case has lately come under my observation in which an injector was discarded in favor of a feed pump and an exhaust steam heater, which has resulted in saving over 500 lbs of coal a day.

On the day of purchase, injectors cost so little in comparison with feed pumps and heaters, that they are often chosen for that reason alone, and the coal heap suffers every day in the year thereafter.

I know a man who asked advice as to which he should buy, and on being told that if he had room for a heater a feed pump would be better, he indignantly replied that he did not want a heater, the water went in hot enough for him from an injector, and forthwith he bought an injector.

The water does go in hot from an injector, but it takes live steam to make it hot, and live steam costs fuel, whereas the heater using exhaust steam does not draw on the coal heap.

To some it may appear that it cousumes a great amount of force to run a feed pump. Where does the force come from? From the boiler. Where does it go? Into the boiler, all of it, except the small amount consumed by friction and inertia.

It is taking pressure from the top, and putting it in at the bottom of the boiler, and the same circumstances of pressure, friction and inertia attend the use of the injector.

The pump also has the advantage of a continuous feed, which is no small item.

Feed water heated by exhaust steam to 200° temperature effects a saving of 168 units of heat for each pound of feed water, 200—32=168. One pound of water converted into steam contains 966 units of heat. 966÷168=5.75, which shows the proportion of gain to be one in five and three quarters.

ANTHON.

Defiance, O.

Relative Economy of Injectors and Steam Pumps.

Editor American Machinist:

The article signed George N. Comly, in last issue of your paper, gives the impression that the injector when used for boiler feeding gives the same results, in point of economy, that a steam pump does when used in connection with a heater for utilizing the exhaust steam from the pump for heating the feed water, while all tests that have ever been made, and accounts of the same published, show that the steam pump is far ahead of the injector in point of economy in the use of feed for that work. If this is not the fact, let us have the truth of the matter.

ENGINEER.

General Considerations in Machine Design.

BY JOHN O. TRAIDE.

In this day of progress, when new machines and tools are brought before the public almost hourly, and when everything in the line of mechanical contrivances are progressing, it may be worth while to stop and consider whether the actual rate of improvement is in keeping with the apparent rate. There are at present over 250,000 patents recorded at the United States Patent Office. It cannot be denied that many useful and in every way worthy appliances are the results of this; yet, when we come to observe the great number of machines of the same class made, or at least patented, as compared with the really useful ones, it leads to the belief that not one patent of every ten issued is an improvement. Evidently there is much misdirected study, and much time and money spent to but little purpose.

It is my object in this to consider the subject of planning mechanical devices or appliances in its general aspect, without descending to details, except, perhaps, for the purpose of illustration. Machine design is used in the sense that it is that branch of applied science which embraces the principles involved in the planning of machines, tools, instruments, etc. The subject may be supposed to present itself in the form of a problem, in which there is given a desired mechanical result, and required a mechanical contrivance which will produce this result. This is, perhaps, a broader meaning than the common use of the term would allow; but, for want of a better term to express the idea, it is retained. The office of the designer is to furnish plans and instructions by means of which a successful mechanical contrivance, which will produce a desired result, can be made. It may involve invention, but is supposed to be confined rather to the selection from known appliances than the search for the new or unknown. For convenience of discussion, it is supposed that the designer determines the machine to be made both as to generalities and as to details; that is, the workman simply carries out the instructions of the designer, although in practice the workman sometimes modifies the designer's plans.

The machine problem is complex. Its ultimate object is economy of labor, which involves the cost of producing the machine, cost of running, adaptability to the work required, and often strength and lightness. The chief difficulty in the way of successful practice lies in the antagonism of the elements. For example, first cost is opposed to strength and durability, because the latter depend upon the amount and quality of material used, and the degree of skill expended upon it. It may be laid down as a general rule that the non-essentials shall be sacrificed to the essentials; but, in the general problem of machine design, it is difficult to tell what should be the first consideration, since the elements are greatly inter-dependent. But particular cases will generally point out what is of the greater importance.

Some of the first questions in designing a machine are: What shall be the work? How much shall it do? Shall it be combined or simple? The classification of machines into combined and simple is not very definite. Thus a drill press is, in one sense, a combined machine, since it is made to drill holes of various sizes and in various materials; again, it is simple, since it does but one class of work; that is, drilling. There are, however, examples of machines belonging to the same general class, but the work differs so much as to require a change in the mechanism that renders them quite distinct.

A product or result of labor is brought about by a series of efforts, which can be grouped into processes or parts, and it will be a question for the designer whether it is better economy to have a separate machine for each part, or to let one machine comprehend two or more parts, so that a problem in machine design may involve one machine or a set of machinery. In designing a combined machine, the following items should be observed: First, that the several purposes for which it is intended shall be as near together as practicable; and second, that the use of one part shall not interfere with the use of others.

The law that power varies inversely as velocity, and hence that what is gained in one is lost in the other, is of universal application in machinery. It follows, then, that the efficiency of a combination depends upon the relative velocities or powers of the first and last pieces of the train, irrespective of the means of transmission, friction being neglected.

Some years ago I saw a model for a horse-power, in which an endless screw was made to act on a spur gear near its periphery, evidently to gain power. Power was gained in this part of the machine, but at the expense of speed, and the gain was used up in speeding up the remaining parts to the required final velocity. It is, however, sometimes necessary or convenient to resort to the otherwise useless variation of increase or decrease of velocity for the accomplishment of an intermediate result.

Choosing the elements or primary movements by which a mechanical result is to be produced is an important part of the work. Not only does this choice determine the materials of construction, but also perhaps, in a greater degree, it determines the durability and usefulness of the machine. Those movements should be chosen first which will produce the necessary result, as positive movement by toothed wheels and links or other movements, etc.; and second, those movements which will be least affected by wear of parts. This may be separated into two movements—those movements which cause the least wear, as rolling contact in contrast to sliding contact, and those movements in which wear, even if considerable, is of little consequence. Under the head of movements would also come the idea of safety.

Choice of movement also involves, to some extent, the cost of manufacture, and the capacity of a shop to turn out different kinds of work should be considered when it is made.

The various parts of a machine should be so proportioned that they possess the requisite strength, and that they do not interfere with each other. A knowledge of the resisting properties of the different materials used in machine construction to the various strains applied to them, as tension, compression, torsion, etc., is absolutely necessary. The kind of material must be determined by its quality and availability. This part of machine design allows the exercise of taste and economy—elements which are not overseriously considered in common practice. Proportioning of parts is determined somewhat by the elements selected, but yet it has a latitude upon which the judgment of the engineer may be exercised to advantage. Thus a link in its simplest form is a solid bar, with a hole through each end for a joint, but its durability is greatly increased when it takes the form of a connecting-rod, with adjustable boxes, for taking up lost motion due to wear. Proportions will be modified by the division of a piece into parts for the convenience of manufacture, as in the case of large fly-wheels which are made in halves or pieces.

Objects with which we are brought into daily contact are more tolerable when their forms please the eye, and work with them is rendered pleasanter to that extent. Hence it is desirable that a degree of artistic taste be exercised in machine construction. Machines should be of such form as to please the eye, but these forms should be in keeping with the circumstances. It should be remembered that machinery is intended for use. Fine lines, creases, etc, should be avoided, since they are hard to keep clean.

More thought has been spent on the invention than on the construction of machines. A good principle may fail in application through poor construction.

In order to design successfully, it seems necessary that the designer should be acquainted with the various elements of machinery and their efficiency. He should be acquainted with the materials of construction, their properties, desirability and availability. He should know the capacity of shops for turning out work both as to quantity and quality, and he will be greatly aided by a knowledge of the uses of the machine or tool which he is designing.

The "big brown bear" of the following must have thought himself a tenant of an upper flat in a New York apartment house: "A big brown bear at the Black Hills found and ate a bushel of salt with great gusto. An hour later he was seen at the bank of a creek, assiduously drinking, and occasionally raising his head to look up stream and see if the supply of water was likely to hold out."—*N. O. Picayune.*

The consumption of steel rails for the year 1881 is set down at 6,175,000 tons.

Sunlight is about 70,000 times the intensity of the light of the full moon.

There are said to be 91 Bessemer steel works and 280 converters and Siemens furnaces at present in operation in the world.

Mental and Physical Development in Moulding.

BY THOMAS D. WEST.

The art of moulding demands both physical and mental labor, one being as necessary as the other. No one can become an expert workman at the business unless he is well endowed, both physically and mentally. Physical endowment does not imply that the man shall be an athlete, or possess the strength of a giant. Good health and a sound body are all that are required in this respect. A man cannot do justice to his mental qualities unless he is well, physically.

The physical qualities of a man—strength, endurance, dexterity—may be readily tested, but mental qualities are not so easily put to the test. Circumstances must bring a man to face some problem requiring thought and study before he can demonstrate his possession of the necessary qualities. Working at the trade of a moulder is well calculated to develop one's physical powers, even in spite of himself, but whether his mental qualities are proportionately developed will depend entirely upon his disposition to cultivate them. It may be possible to drive the moulder into working hard with his hands, but it is impossible to drive him into studying and thinking of his work. It might be better if this were possible.

Bad castings are generally the result of mental errors. The hands cannot make a move towards making a mould except they are guided by the mind, and yet but little attention is paid to the all-important subject of learning to think correctly. It is a good thing to be physically strong, but it is often a better thing to be mentally strong.

If a man were to keep his arms tied up in a sling for six months, and then loose and try to use them, he would find them weaker than before. Darwin says that the disuse of a member of the body will in a few generations cause its disappearance. Constant reasonable use develops the members of the body. How many can testify to a similar development of the mind by study?

Many say they are not paid to think. Every man is paid for thinking, but most workmen are not paid as well as they would be if they thought more and better. Mental qualities are probably to some extent inherited, but they are susceptible of cultivation, and to almost any extent.

As a rule, a man, especially a moulder, must do his study when he is not working, but in his work he can constantly test his study, and so his physical will assist his mental efforts. The greatest mechanical masters have become such by thinking for themselves, and by studying others' mishaps as well as their own.

A moulder may say: What can I study that will advance me mentally? Almost every bad result in making castings can be taken as a lesson. Some of the lessons will be easy, others hard, but all important. In studying them, it may be necessary to visit libraries, consult the chemist, or ask questions of those who know more than we do. It may lead us to do things that others will consider foolish. Many of our greatest mechanical achievements spring from just such "foolish" things. An ambitious moulder can always find abundant material for study, not only in his own mistakes and poor success, but in those of others. Many seem to learn only by their own blunders, while others learn equally from the blunders of others. If we learn only through our own experience, our progress will be slow, and our life full of blunders.

No mechanic should depend on his physical abilities. It is only by developing his mental qualities that he can hope for success. The early morning is unquestionably the best time for the working man to study. His mind is then clear, and his thoughts will not be handicapped with the day's doings. An hour or two spent in this way every day will show astonishing results in the course of a year. If the morning cannot be devoted to this, then devote the evenings; but, in any case, devote an hour or two each day to studying in the line of your business.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Pres't.

JACKSON BAILEY, Vice-Pres't.

LYCURGUS B. MOORE, Treas. and Sec'y.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

LEWIS F. LYNE, F. F. HEMENWAY, } Mechanical Engineers.

The American News Company,

Publishers' Agents, New York.

The International News Company,

11 BOUVERIE STREET, (Fleet Street), LONDON, ENG., will receive subscriptions for the AMERICAN MACHINIST at 16/8 per annum, postage prepaid.

DEALERS SUPPLIED BY

The American News Company, New York.
The American News Company, Denver, Col.
The American News Company, Kansas City, Mo.
The American News Company, Omaha, Neb.
The American News Company, St. Paul, Minn.
The New York News Company, New York.
The National News Company, New York.
The New England News Company, Boston, Mass.
The Central News Company, Philadelphia, Pa.
The Western News Company, Chicago, Ill.
The St. Louis News Company, St. Louis, Mo.
The Cincinnati News Company, Cincinnati, Ohio.
The Detroit News Company, Detroit, Mich.
The Pittsburgh News Company, Pittsburgh, Pa.
The Baltimore News Company, Baltimore, Md.
The Rhode Island News Company, Providence, R. I.
The San Francisco News Co., San Francisco, Cal.
The Brooklyn News Company, Brooklyn, N. Y.
The Williamsburgh News Co., Brooklyn, E.D., N. Y.
The Newark News Company, Newark, N. J.
The Northern News Company, Troy, N. Y.
The Albany News Company, Albany, N. Y.
The Washington News Company, Washington, D. C.
The New Orleans News Company, New Orleans, La.
The Montreal News Company, Montreal, Canada.
The Toronto News Co., Toronto, Ontario, Canada.
The Toronto News Co., Clifton Branch, Clifton, Ontario, Canada.

SUBSCRIPTION.

$3.00 a year, in advance, postage prepaid in the United States and Canada.
$4.00 to Foreign Countries, postage prepaid.

ADVERTISING.

Transient, 35c. per line each insertion.
"Business Specials," 50c. a line.

EDITORIAL ANNOUNCEMENTS.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, MARCH 31, 1883.

CONTENTS.

PAGE

Universal Automatic Gear Cutter..... 1
Locomotive Engine Running. By Angus Sinclair..1-2
Improved Upright Drill..... 2
Wilkinson's Positive Combination Clutch..... 3
An Apparent Anomaly..... 3
An Ingenious Machine..... 3
Affairs of the New England Manufacturers' and Mechanic's Institute..... 3
Petroleum Fuel in a Rolling Mill 4
Six-Inch Cutting-Off Machine..... 4
Machine Tools—Countershafts. By Oberlin Smith. 4
50-Inch Chucking Lathe..... 5
To Turn a Shaft Properly—By John J. Grant..... 5
Wire Rope Transmission..... 5
Elliott's Improved Drill Press 6
Letters from Practical Men—Petroleum as Fuel—Notes on a Boiler Test—Heating Feed Water—Relative Economy of Injectors and Steam Pumps..... 6-7
General Considerations in Machine Designs. John O. Traide..... 7
Mental and Physical Development in Moulding. Thomas D. West..... 7
Need of Learning Mechanical Drawing..... 8
Annual Boiler Inspection Bills..... 8
State Aid for Apprentices..... 8
Questions and Answers..... 8
Business Specials..... 9
Manufactures..... 9
Machinists' and Engineers' Supplies..... 10
Iron and Metal Review..... 10

Need of Learning Mechanical Drawing.

The need for machinists and other shopmen to know something about making mechanical drawings is becoming more widely recognized every year. Still, the number of mechanics who can make good mechanical drawings to work from are comparatively few. There are, in fact, a large number of machinists who do not understand mechanical drawings sufficiently to work from them without verbal instructions. This deficiency has been very widely felt, perhaps in no other kind of shops more than in railroad repair shops. Often the foremen are to blame for this. Workmen must have instruction, or some special facilities for learning, before they can be expected to acquire any special technical knowledge. In some shops they are accorded the necessary facilities for learning to make and use mechanical drawings. We frequently hear from such shops. For instance, the foreman in charge of one of the N. Y., L. E. and W. shops writes us that he has just started a drawing-school on a small scale for the men in that shop, and asks about a certain text-book. We are always ready and willing to assist in such cases as much as lies within our province to do. A knowledge of the draughtsman's art is needed to enable mechanics to develop their original ideas in regard to mechanism, and apply them in some tangible way. The work of the draughtsman constitutes the leading part of mechanical literature.

Annual Boiler Inspection Bills.

As the steam boiler law applying to New York City now stands, and has stood for several years, all steam boilers in use must be inspected by officials (engineers) of the police department, except they be inspected and insured by a regularly constituted boiler insurance company. Every winter some member of the Legislature introduces a bill to require *all* boilers, without exception, to be tested under the direction of the Police Board by hydrostatic pressure. Some winters two or three bills of the kind are introduced. Some of them provide for the payment of an annual fee by engineers (not now required). Two bills embodying these provisions are now before the Legislature. Heretofore the users of steam in New York City have protested against their passage, and we presume they will do so this year, if there appears to be any probability of their passage. Those who have their boilers insured by a reliable boiler insurance company, and therefore periodically inspected both inside and outside, should not be troubled by another inspection by a police engineer. They would anticipate, if such extra inspection were required, a great deal of annoyance growing out of jealousy towards the insurance companies' inspectors. Boilers entirely safe might, and probably would be, condemned, and the business of their proprietors stopped by shutting down the steam. Every boiler should be inspected, as the law now requires, and the old hydrostatic test (for boilers in use) should give place to the hammer test. By this method only can all the defects of a boiler be discovered.

State Aid for Apprentices.

Some weeks since our contributor, Angus Sinclair, wrote an interesting letter on the needs of technical instruction to Hon. James Wilson, railroad commissioner of Iowa and Congressman-elect from one of the districts of that State. It was given to the Cedar Rapids *Republican* by the recipient, and published by that journal. This subject is one of the most important that can be considered as affecting our national industrial interests. In closing the letter, Mr. Sinclair says:

"To compete with a country where an intellectual crusade like this is marching on, our people need something besides the money required to build, equip, and run factories. They need brain development; and they will have to adopt means similar to what their rivals are successfully using. In every town that aspires to appear or flourish as a manufacturing center, schools should be established for the instruction of our rising generation of artisans. There is plenty of desire among the young men and boys to learn the philosophy of their business, but there is no means of feeding this mental hunger. Iowa boasts with show of reason of her liberal support of schools. No expense has been spared to establish institutions for preparing youths for graduating in the so-called learned professions, but as yet nothing has been done in the interests of industrial training. Looking to the broad interests of the State, to the wide principle of justice, our young mechanics have as good a right to the scientific instruction that relates to their business, as have doctors and lawyers and clergymen. These genteel trades are coddled and pampered, the mental appetites of the too numerous youths who enter life in that line are satiated with luxuries; but the poor boy whose work of moulding stoves or plow boards is really of more value to the State, cannot find out why one heat turns out good soft iron and the other hard brittle stuff that will scarcely hold together."

We have always contended that the State should aid in the instruction of mechanics as much as in the instruction of lawyers, clerks, doctors, or students for any of the "learned professions." This fact is recognized in England, France, and Belgium, but not in the United States. As a result, skilled workmen are often imported from those countries. About the only benefit the American artisan has had conferred upon him by legislative action is the advantage of a protective tariff. This, however, cannot be depended upon for everything. Even its continued existence is constantly threatened. If the United States is to maintain its position among manufacturing nations, the education of mechanics must receive some support from the State, for the old apprentice system is defunct.

One of our subscribers writes: "If your correspondents in regard to shafting, would state how they turn the shafting, their contributions would be of some benefit to machinists instead of telling us how much they can do." We suppose the correspondent particularly referred to is John J. Grant, who in a recent issue told our readers how much shafting he has turned per day upon a lathe of his own make. Mr. Grant wrote an article entitled "To Turn a Shaft Properly," which appeared in the AMERICAN MACHINIST December, 1878. As this issue is out of print, and the article will interest a large portion of our present enlarged circle of readers, we reproduce it this week.

The managers of the New England Manufacturers' and Mechanics' Institute announce to parties intending to apply for space in the next fall's exhibition to do so as soon as possible, as a large part of the space has already been applied for by Western and Southern exhibitors. The two exhibitions already held have been very largely attended. Exhibitors of machinery and tools made quite extensive sales as a result of their displays. No medals, diplomas, or other gewgaws are distributed as awards.

A correspondent writes us inquiring for a book on setting up engines and other heavy machinery, complaining that while he finds plenty of books treating subjects much more generally understood than this, he has been able to find nothing bearing on this subject. The inquiry of our correspondent is a very common one, to which we have frequently answered that we knew of no book covering the ground suggested. The question is not an easy one to handle, since the plan to be pursued in setting up an engine, for instance, is subject to a variety of modifications to suit varying circumstances. We shall be glad, however, to hear from some of our practical correspondents on the subject, who we are sure can detail their experience and practice in a way that will not fail to prove of advantage to a great many who are in search of information on this subject. We may say that those that are ready to learn by the experience of others in respect to such matters are not alone those without experience, but as well those of the greatest experience. It would be hard to find an engineer or mechanic who is satisfied he has nothing to learn of setting engines and heavy machinery.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(116) J. E. M., Taunton, Mass., asks: Will you please tell me how to find the pitch of a bevel gear? *A.*—It is customary to measure the pitch of a bevel gear on the largest pitch diameter, that is, its pitch is the distance apart of two adjacent teeth measured on the greatest pitch diameter of the wheel.

(117) J. R., Glen Rock, Pa., asks: How shall I make tools for turning chilled cast iron of a moderate degree of hardness? *A.*—Use the best steel for your tools, forge carefully and harden without drawing the temper. The cutting angle should not be so great as for softer iron, and the speed, in turning, slow.

(118) Constant Reader, Brooklyn, N. Y., asks: Suppose a cistern 10 feet square filled with water shows a pressure of 10 lbs. per square inch at a distance of 20 feet from the bottom, what will the pressure be 40 feet from the ground? *A.*—The pressure will be 1 lb. less for each additional 27.68 in height. Hence for 20 feet (240 inches) the pressure will be 240÷27.68=8.75 lbs. less, or 10−8.75=1.25 (1¼) lbs.

(119) W. G., Toronto, Canada, writes: Please give me a rule for cutting spur gears. For example: I want to cut 25 teeth in a blank of 1" diameter. What size cutter would be required and what should be the depth of tooth? *A.*—You can only determine the shape of cutter for any special case by making a drawing of the teeth to be cut. You will find the subject illustrated and explained in the AMERICAN MACHINIST of Aug. 7, 14 and 21, 1880.

(120) C. S. C., St. John, N. B., asks: Will you give me a rule for finding the size of pulleys on a Judson governor to run the engine at different speeds? *A.*—You will find the governor marked the speed at which it should be run without reference to the speed of the engine. To find the correct diameter of pulley for the governor: Multiply the number of revolutions per minute you wish the engine to run by the diameter of the pulley on the engine shaft, and divide the product by the revolutions the governor is marked to run at. Example: Engine to run at 100 revolutions per minute; diameter of pulley on engine shaft 12 inches; speed of governor 150; then 100 multiplied by 12 equals 1200, which divided by 150 equals 8, which is the diameter in inches of the governor pulley.

(121) W. L., Hamilton, N. Y., writes: I have charge of a boiler 45 inches in diameter and 9 feet in length, with 52 tubes 3 inches diameter. The feed enters at front end directly over fire. Would it be a saving of fuel to put in a perforated feed pipe? *A.*—The saving in fuel will not probably be very apparent, but we think it will be better to feed further forward. You can run a pipe a little below the water line to near the back end of boiler, and perforate the pipe on the sides beyond the grate surface, so as not to feed any water over the fire. The back end of the pipe should be stopped up. 2. Should arch touch boiler at water line? *A.*—If at all, at water line. 3. Can I get a license as an engineer without personal application? *A.*—No.

(122) Engineer, Philadelphia, Pa., writes: D. K. Clark, quotes water at 200° F. as weighing 60.081 lbs. per cubic foot, and temperature of steam at 85 lbs. absolute as 316.1° F. Nystrom quotes water at same temperature as weighing 60.1146 lbs. per cubic foot, and steam of same pressure as having a temperature of 318 4° F. Which is right? *A.*—There is a slight variation in the steam tables of different authors, and for all that is known to the contrary either or neither of them may be right. In regard to the weight of water: according to Charles T. Porter, of the commissions appointed by five European governments to determine the weight of a cubic foot at a temperature of 60°, no two agreed, which may be taken as an evidence that it is not easy of accomplishment, and also will account for the different opinions of authors on this subject.

(123) W. B. K., Reading, Pa., writes: I wish to make three spur wheels to run in the place of three others, the new ones to be coarser pitch than the old ones. The large wheel should be about 4 feet in diameter, and into this wheel run two pinions of different diameters, the distance from center of wheel to center of one of the pinions being 30 and 13-16 inches, and from center of wheel to center of the other pinion 31 and 13-16 inches. The pitch of the wheels should be about 1¾ inches. What should be the diameters and exact pitch of the wheels? *A.*—You cannot accomplish all you want to and make the wheels to correct size and keep the centers as at present. One pinion will be 2 inches larger than the other, which will determine the nearest pitch to 1¾ inches possible. This will add 2×3.1416=6.2832 inches to the circumference, and adding four teeth for this the pitch will be 6.2832÷4=1.57 inches. The number of teeth in the

large wheel which will correspond to a diameter nearest 4 feet is 96, the exact diameter of this wheel being

$$\frac{96\times1.57}{3.1416}=47.97 \text{ inches.}$$

The number of teeth in the smallest pinion will be 28, which corresponds to a diameter of

$$\frac{28\times1.57}{3.1416}=13.99 \text{ inches,}$$

and the largest pinion will have 32 teeth, and be 15.99 inches diameter. The centers will then be

$$\frac{47.97\times13.99}{2}=30.98 \text{ inches, and}$$

$$\frac{47.97+15.99}{2}=31.98 \text{ inches}$$

instead of 30.81 and 31.81 inches, as given.

(124) Old Bore, Columbus, Ohio, writes: I have been placed in charge of an engine and boiler. The boiler is 3 by 16 feet, with 2 flues. I found the boiler set with a clear run, and had the grate bars dropped 4 inches at the back end and bridge wall built up to within 6 inches of the boiler. I had the bridge wall made about 18 inches wide at the top, and slanted down to the bars at an angle of 45°. We have a box that the fireman fills with coal in the morning, and before the change was made in the setting we burned it all, but now we burn only three quarters of it. I should like to ask: 1. Did I do right in arranging the grate and bridge wall? *A.*—The best evidence that you were right is in the decreased consumption of coal. 2. Behind the bridge wall the run is 3 feet all the way to the back end of the boiler. How much, if any, shall I fill it in? *A.*—You can fill in slanting up from 3 feet at bridge wall to 2 feet at back end. 3. Is one bridge wall sufficient? *A.*—Yes. 4. What size steam pipe ought an 8″×14″ engine have, running 140 revolutions per minute? *A.*—2½ inches. 5. Can I speed the engine higher, everything being in good condition? *A.*—It cannot be definitely told whether it would be best to speed the engine higher without an examination. The presumption is that there will be no trouble from increasing the speed. 6. How can I arrange in a simple manner to get a reverse motion to a moulding machine from an upright countershaft? *A.*—You can use two pulleys on countershaft, with friction clutch.

(125) J. W. P., Ontario, Canada, writes: The water with which our boiler is supplied is drawn from a well just outside the engine room. The water contains considerable lime, and there is scarcely enough of it, so the water from the boiler, which is blown off every two weeks, is blown back into the well to be used over again. There is plenty of water a quarter of a mile away, and I want to ask: 1. In your opinion would it not be better to haul water that distance than to blow off into the well? *A.*—We should say yes, decidedly. 2. I have proposed the following plan, and ask your opinion of it: Place a cistern under the engine room floor and into this cistern turn the drip from the heater, also in drawing water from the well pass it through the heater and then into the cistern, then feed from the cistern through the heater to the boiler. Quite a quantity of water is used in the foundry, which is taken from the well. I propose also to pass this water through the heater, for the purpose of increasing the water of condensation which will be pure? *A.*—As we understand you, your purpose is, by passing as much water as possible through the heater to condense the exhaust steam and return it as water to the cistern. The objection to returning the drip to the cistern is that all the oil used in the cylinder of the engine finds its way back into the boiler, where it is likely to cause trouble. We should not recommend returning the heater drip to the cistern. 3. It only requires 25 lbs. of steam to run the engine Would it be better to carry higher steam, say 60 lbs., and use it expansively? *A.*—Unless there are circumstances we do not know of, it would require less water to use the steam expansively.

(126) Petroleum writes: I have attempted to follow your directions in using crude petroleum in a boiler to prevent scale, but have met with a bad result at the commencement. I have two boilers, one of which I blowed off and filled with cold water to cool it off. I then let the water out. I broke a joint at the top of the boiler and poured in some of the stuff of the kind sent you, of which I bought a barrel. The first thing I knew it took fire, the flames ran up to my hand and burned it quite badly. I send you a sample of the stuff with a request that you tell me what it is. *A.*—The sample, supposed to be crude petroleum sent us, is a very light oil, consisting chiefly of naphtha. Its specific gravity is about 0.55, whereas crude petroleum as it flows from the ground has a specific gravity of 0 72 to 0.82. In experiment an oil which flashed at a temperature of 113° Fahrenheit was by the addition of one per cent. of naphtha reduced to 103° F., and to 83° by the addition of five per cent. naphtha while with the addition of twenty per cent. the mixture actually burned at 50° F. The sample you sent us ignites and burns freely at 30° F., which is two degrees below the freezing point. In view of the fact that in some localities crude petroleum is difficult to obtain, and sometimes causes a crust within boilers when used in connection with water containing certain ingredients it would therefore be advisable to use the best kerosene oil which flashes at 150° F. This oil will do no harm in boilers and will answer better in some instances than petroleum. You made a mistake in putting the oil into the boiler when there was fire anywhere near it, for the reason that it emits a gas that will take fire at a normal temperature. The best way to feed liquids into a boiler is to attach a reservoir to the suction pipe near the feed pump or injector so that by opening a communication with the feed pipe the contents of the reservoir will be carried into the boiler with the feed water. Such a reservoir is easily made by taking a piece of iron pipe and screwing a cap upon each end, then by two nipples and a cock connecting it with a tee or elbow upon the suction pipe. A common steam plug may be inserted in the top by which to fill the reservoir.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J

James W. See, Consulting Engineer, Hamilton, O.

Lyman's Decimal Table. Price 10c. Address, Edward Lyman, C. E., New Haven, Conn.

Mechanical Engineer. Complete motive power outfits a specialty. Peter Banta, Cold Spring, N Y.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Machine designing and general engineering work, T. J. Winans, 54 M. & E. R. R. Av., Newark, N. J.

J. C. Hoadley, Engineer and Expert, 28 State St., Room 28, Boston, Mass.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

W. F. Merrill, 27 Kilby Street, Boston, Mass. Detailed Mechanical Drawings carefully prepared.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

For sale, 25″ lathes of best designs from new patterns. George A. Ohl & Co., E. Newark, N. J.

Chas. T. Porter, Mechanical Engineer, Tribune Building, (Room 42,) New York City.

Universal grinders for lathe-centers, chucks, angles or cylinders. C.C. Hill, room 8, Uhlich Block, Chicago

For a strictly first-class automatic engine of from ten to sixty horse-power, address, The Straight Line Engine Co., Syracuse, N. Y.

Steel Forgings, either plain or crank, up to 10,000 lbs. in weight. Address, Pennsylvania Steel Co., 160 Broadway, New York.

Pattern Maker's Assistant. By Joshua Rose. 324 pages, $2.50 by mail, postpaid. Address orders, P. O. box 3,306, New York City.

A handsome monthly journal sent free to engineers and mechanics. Enclose four 3-cent stamps for year's postage and receive paper. Money Saver, 95 Liberty street, N. Y.

"Patent Binder" for the AMERICAN MACHINIST holds 52 weekly issues in good shape. Sent to any address by mail for one dollar. American Machinist Publishing Co., 96 Fulton street, New York.

Free—"Useful Hints on Steam." A book of 96 pages, illustrated. Valuable to engineers, steam users and those about purchasing steam machinery. By mail, 15 cents, or free on personal application. E. E. Roberts, 107 Liberty St., New York City.

Now ready for delivery, volume 5 of the AMERICAN MACHINIST, comprising the year 1882, (52 issues) complete with index, in substantial book form Also a few remaining of volumes 3 and 4 comprising the years 1880 and 1881, can be sent anywhere by express. Price of each volume, $4.00; express charges to follow. AMERICAN MACHINIST Publishing Company, 96 Fulton street, New York City.

MANUFACTURES.

A saw factory is to be established at Eau Claire, Wis.

Minnesota capital is going to erect a woolen mill at Yankton, Dakota.

The Chicago Hardware Mfg. Co. will double the capacity of their works after May 1.

Howard, Perley & Howard are building a saw mill and wooden ware manufactory at Emporium, Pa.

The Bullard Repeating-arms Company at Springfield, Mass., talk about building a new factory this spring.

Metz, Heinlen & Co., of Burlington, Ia., have just completed, as an addition to their works, a foundry 36×40 feet.

It is probable that the Franconia Iron Company will soon erect reduction works at the mine, at a cost of about $13,000.

It is said that the old Otis Tube Works, Cleveland, O., will be started up as a branch of the National Tube Works Co.

It is said that a stock company is soon to be formed who propose erecting a large rolling mill just east of Winooski, Vt.

The Union Evaporating Company, just formed with a capital of $200,000, will erect a sugar refining mill at Naugatuck, Conn.

A wood-pulp mill with a capital of $100,000, subscribed by New York and Philadelphia parties, is soon to be started at Shickshinny, Luzerne Co., Pa.

It is reported that David N. Selleg, a blind man, has started a manufacturing enterprise at Newburg, N. Y., in which only blind persons will be employed.

The Export Mfg. Company has been organized at Cleveland, O., with D. McClusky, President R. R. Rhodes, Vice-President, and Herman Mayer, Secretary.

The Moline Scale Company, of Moline, Ill., expect shortly to remove their works, and on ground recently purchased by them erect a large foundry and other buildings.

The Standard Brass Company has new works at 132 West Lake street, Chicago, which will be in operation in about two weeks. The factory is 45 x 65 feet, three stories high.

Utica, La Salle County, Wis., wants a glass factory, and offers as a bonus a free building site, exemption from taxes for twenty-five years, and a stock subscription of $25,000.

A new stove manufacturing establishment, it is reported, will soon be put in operation at Newcastle, Lawrence County, Pa. It is expected it will give employment to 300 men.

The new factory of the Florence Manufacturing Company, at Florence, Mass., will be of brick, 40x100 feet, three stories high, connected by covered ways with the present works.

E. C. Atkins & Co., the saw manufacturers, at Indianapolis, Ind., report business in such a flourishing condition as to necessitate a night and day force of men, running their works twenty hours a day.

It is expected that the George R. Dickinson Company's new paper mill at Holyoke, Mass., will begin operations about the 20th of March. The establishment is 300×400 feet, and has a capacity of twelve tons a day.

The H. B. Smith Manufacturing Company, of Smithville, Burlington, N. J., has ordered for its works a 100 horse power engine, the water power being insufficient for the rapidly increasing business of the company.

Augustus Seeman, of Vineland, N. J., has purchased the right, title and machinery of the Wheatland Manufacturing Company, at Wheatland, Ocean County, and will at once establish a new settlement there.

It is rumored that negotiations are pending between the Esty Sewing Machine Company and the Victory Sewing Machine Company at Middletown, Conn., for the purchase and occupancy of the latter's property as soon as vacated.

The *Industrial World* says the new works of the A. Piamondon Manufacturing Company, of Chicago, have the largest capacity and constitute the most complete plant of any in the West for the manufacture of shafting, pulleys and hangers.

The Northern Pacific Railroad Company has perfected arrangements for the erection of large and costly passenger depot, machine shops, round houses and car shops at Portland, Oregon. The road will probably be completed within a year.

A majority of the Committee on Manufactures of the Massachusetts Legislature has reported a bill permitting local authorities to empower manufacturers to cause to be rung bells, gongs or whistles to be used for the benefit of their employes.

Thackara, Buck & Co., of Philadelphia, Pa., gas-fixture manufacturers, have purchased the Unitarian church building, northeast corner of Tenth and Locust streets, in that city, for $40,000. The structure will be demolished, and a large factory erected on the site.

The Union Stove Co., of Boston, Mass., have erected a new building 115×50 feet, three stories high. Most of the tools are in place, and fifty workmen are employed in the manufacture of emery wheels and emery wheel machinery. They expect to be in full operation by July.

D. M. Dillon, boiler maker, Fitchburg, Mass., is making a five-foot steel tubular boiler for Lee, Blackburn & Co., woolen manufacturers, of Lawrence, Mass. This boiler will be set with the Jarvis patent furnace, and use the Sheffield grates, burning screenings and soft coal for fuel.

There are four chimneys in Lowell, Mass., over 200 feet tall. The Merrimack corporation has two—one 282 feet 9 inches, and one 206 feet; the Tremont & Suffolk has one of 225 feet, and the Lawrence one 211 feet tall. "Within the next decade," says the *Vox Populi*, "we shall have one over 300 feet in height."

Several new manufacturing interests of more or less account have located at Plainville, Conn., notably the Globe Clock Company, and a manufacturer of piano and organ hardware. Several more are said to be in contemplation. New machinery is being put in at the cutlery works for several new patterns of knives.—*Boston Commercial Bulletin.*

It is stated that the rubber works at Woonsocket, R. I., recently started, will remove to Franklin, Mass., and will be in full operation by the first of April, all the machinery being in position. The capacity of the works will be 1,000 pairs of boots and 1,000 pairs of shoes per day. The managers of this company have not joined the combination.

W. P. Davis, North Bloomfield, N. Y., writes us: Business is very good with slotting and key-seat machines. We are sending them out as fast as we get them finished. Have this day filled orders to Ripley & Kimball, St. Louis, Mo.; J. M. Badger and Maxwell, Manning & Moore, New York City; Miller Co., Canton, O.; O. L. Packard, Milwaukee, Wis., and Richmond Machine Works, Richmond, Ind.

F. W. Richardson, Troy, N. Y., has commenced to build with a view to double his capacity to manufacture balanced slide valves for locomotives and other engines, and is putting in a new "Payne" automatic engine. In addition to his increasing business in the way of balanced valves, he has several orders for his "model valve motion," designed to assist in planing valves and valve motions.

The machinery manufacturing and repairing firm of Williams & Company has been dissolved, Mr. John Bowers retiring. The business of the old firm will be carried on by Mr. J. E. Williams with increased facilities, he having recently bought a large quantity of new machinery, such as drill presses, planers, etc. Mr. Williams will also considerably increase his working force.—*St. Louis Age of Steel.*

The Paige Wrought Metal Car Wheel Company, of Springfield, Mass., has just been reorganized as the Paige Car Wheel Company, and will remove its works to Cleveland, about April 1, 1883. The new shops are now being built at Cleveland, and will be 50 x 100 feet in dimension, 3 stories high. The officers of the new company are J. E. French, president; W. H. Paige (the patentee), superintendent; W. S. Dodge, secretary and treasurer.—*Railway Review.*

The American Steamship Co., has been incorporated mainly by New York capitalists, to build iron steamships. Ex-Lieutenant Commander Gorringe, will be manager of the works, which are to be in Philadelphia. The old shipyard of the Reading Railroad Co., at Port Richmond, has been leased and buildings are now being erected to contain the machinery. In a week or two the building of ships will commence. Mr. Gorringe's headquarters will be in New York.

Benjamin, Fischer & Mallery's new works at South Chicago are completed and in operation. The main building is 210 feet long by 55 feet wide, and two stories high. The foundation is 48×102, with cupola outside having a capacity of thirty tons a day. The blacksmith shop is 40×40, and contains four fires. The power for the works will be supplied by a 40-horse power Atlas engine and a 60-horse power boiler. One hundred and fifty to two hundred men will be employed.

In conjunction with the new works of the U. S. Rolling Stock Co., to be erected in South Chicago, wealthy land owners contemplate building a manufacturing town which will accommodate the mechanics and workmen employed by the company. The plans of the town and the supervision of the construction of houses, etc., are subject to such approbation of the most competent architects and engineers as shall secure to the new settlement every sanitary advantage which modern science requires for the welfare of the community Work is to be commenced in a short time.

The Standard Foundry Company will have their capital stock increased to the extent of $25,000 on or about April 1st, they having already complied with all legal requirements. The capacity of their works will also be largely increased by the improvements they are now making and by the erection of new buildings. Their new additions, now building, will consist of a brick building, two stories high, 45 feet in breadth and 60 feet deep, the lower floor of which will be used in connection with the foundry, and the upper as a pattern shop, and a new brick office.—*St. Louis Age of Steel.*

Frank Wilkinson in one of his letters from the South, to the *New York Sun*, says: "In many of the little railroad towns of Northern Georgia, small manufacturing industries have lately sprung into life. They are small, it is true, but a start has been made. Plough shops, wagon shops, machine shops, leather manufacturing establishments are becoming common. There is a growing industry in wood working. In almost all the towns there is a hum of turning shafts and wheels, the smell of oil and leather driving belts, and that beacon of prosperity, coal smoke, rising in tiny columns from the factory chimneys."

The June Manufacturing Company are to build new works at once. The company have purchased the southeast corner of LaSalle and Ontario streets, Chicago, Ill., and the ground is being broken for foundations upon which a four-story and basement brick factory, 55×100 feet, will be erected. The works are to be equipped with $30,000 worth of the finest machinery in the country, suitable for their class of work, and combining all the modern improvements and appliances. Power for the works will be supplied by a 75-horse power engine and a battery of two boilers. The entire works will be heated by steam. An effort will be made to have the building ready for occupancy by May 1st.

The Crown Roller Milling Co., Belleville, Ill., Jas. F. Imbs, President, is situated on the Illinois & St. Louis Railroad, thirteen miles from St. Louis. It has a frontage of 60 feet and a depth of 135 feet, and is four stories high. The elevator is 63 feet wide and has a capacity of 60,000 bushels. The mill is now running steadily, averaging about 500 barrels a day, and, by adding a few more rolls, can be increased to 700 barrels. They have a Corliss type of engine, of 400-horse power, which operates with ease the entire system of the mill. The engine is supplied with steam from three large boilers, 46 inches in diameter and 20 feet long. These were set by the Pond Engineering Co., of St. Louis, with the Jarvis patent furnace, to burn slack coal, which they do satisfactorily. These furnaces make a large increase in capacity, and utilize all kinds of waste fuel, even if wet.

Machinists' and Engineers' Supplies.

NEW YORK, March 15, 1883.

There is a gradual improvement in the condition of the supply market, and confidence is being restored. Orders continue to multiply, and all agree that the business outlook for the near future are good.

Manning, Maxwell & Moore, 111 Liberty street, have just taken an agency for the Cummer Automatic Steam Engine, built by the Cummer Engine Company, Detroit, Mich., for New York and vicinity.

Iron and Metal Review.

A better feeling now exists in the Pig Iron market than has been manifested for some time past. Mill men are testing the market, and have instigated considerable inquiry, which are indications of more business. Prices are about the same as last reported.

We quote Foundry, No. 1, $24 to $24.50. Foundry No. 2, X $21.50 to $22.50. Grey Forge, $18.50 to $19.50. Manufactured iron is in fair demand, with no change in prices. Wrought Iron Scrap is fairly active at $26.50 to $27, prime selected from yard and $25 ex-ship. Old Rails are firm at $28, for Double Heads, and $27 for Tees.

Copper is quiet at 17⅝c. to 17¾c., for Lake Superior; Banca and Australian Tin 22c.; Straits and Malacca 21¾c.; English Refined 22¼c.; Spelter, Common Domestic, 4.65c. to 4⅞c.; Refined 8c. to 8¼c.; Lead 4.70c.; Antimony, Halletts, 9⅞c.; Cooksons, 10⅞c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted—A competent salesman for a well known first-class steam engine. Address, with reference, B., this office.

A mechanical engineer, now superintendent, desires a position as draughtsman, superintendent or manager. Address, M., AMERICAN MACHINIST office.

Wanted—A situation as Draughtsman or Foreman. Special attention to machine tools. Address, J. B., AMERICAN MACHINIST.

Wanted—A Mechanical Engineer, graduate of Polytechnic School with experience in actual practice, desires a position as draughtsman, in New York City or near New York. Address, "Active," AM. MACHINIST.

Wanted—A middle-aged active and first-class machinist, who is capable of taking charge of the fitting department in building machine tools Address the Universal Radial Drill Co., Cincinnati, O.

Mechanical Draughtsman experienced in sewing machine work, electrical machinery, &c., having excellent references from first-class houses, desires a position near the city. Address, D., Box 1, AMERICAN MACHINIST.

Wanted—Machinists. Strictly first-class vise hands and fitters. Experienced men, accustomed to machine tool work, can obtain steady employment at liberal wages. Address, Niles Tool Works, Hamilton, Ohio.

Wanted—A man to take charge of an out of town machine shop, manufacturing medium sized, first-class special machinery, and employing from 100 to 200 men. A thoroughly competent man accustomed to making such machinery as lathes or first-class engines, can have a good position by addressing, Box 4, care AMERICAN MACHINIST, 96 Fulton street.

Light and fine interchangeable machinery to order. Foot and power lathes; slide rests, &c. Catalogue for stamp. Edwd. O. Chase, Newark, N. J.

A fairly equipped foundry and machine shop located in county seat and close to railroad, another to cross near shop, another in prospect; large territory; all for $2,000 if sold by April 1st. Terms reasonable. D. C. Baughman, Albion, Ind.

A Great Economic Discovery.

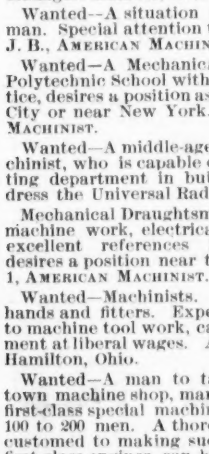
The Universal Coal Saver & Gas Consumer.

This preparation when applied saves 25 per cent. of the Coal.

Write for particulars,

F. E. McALLISTER, Sole Ag't,
31 Fulton St., New York.

COOKE & CO., DEALER IN



Machinery & Supplies,

12 CORTLANDT ST.,

NEW YORK.

AGENTS FOR THE

Greenfield Vertical Engines

2½ to 30 Horse Power.

Unequaled in workmanship and quality of material. Prices lower than any other first-class engine.

ALSO

SUPPLIES

For Machinists, Railways, Mills, Mines, &c.

Please send for circular and state that you saw the advertisement in this paper.

FOR SALE.

We have the following second-hand Machinery for sale, viz.:

One Iron Planer, to plane 24 feet long, 62 in. x 62 in. square. It is powerfully geared, heavy and in good order.

One Iron Planer, to plane 12 feet long, 36 in. x 32 in. in fair condition.

One Pit Lathe face plate 6 feet dia., with internal wheel full dia., external wheel 38 in. dia., quadruple geared, will turn 10 feet dia. and 22 in. face in pit, swing 60 in. over ways, 48 in. over carriage, 21 ft. 6 in. between centers. All complete.

One Engine Lathe, will take 14 feet between centers, and swing 53 in over ways, has hollow spindle, and is adapted for both turning and boring, with countershaft. Complete.

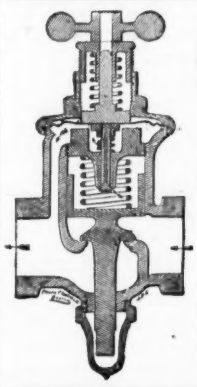
One Engine Lathe, will take in 11 feet, 6 inches between centers, swings 48 inches over shears, and 32 inches over carriage. It has internal gear, and cross-feed, with countershaft. All complete.

One Slotting Machine, 12 in. stroke, slots to the center of 46 in. Adjustable table and universal feed motion.

One Combined Power Punch and Shears, to punch ⅝ and ⅛, and shear ½ in. iron.

Send for Monthly list of New Machinery.

The George Place Machinery Co.,
121 CHAMBERS AND 103 READE STREETS, NEW YORK.



CURTIS

Pressure Regulator

For Steam, Water and Air,

MANUFACTURED BY

Curtis Regulator Co.

51 BEVERLY ST.,

Boston, - - Mass.

GENERAL AGENCIES:
109 Liberty St., New York.
925 Market St., Phila., Pa.
80 Market St., Chicago, Ill.
Cor Holliday and Saratoga Streets, Baltimore.

JOSIAH MACY'S SONS,

189 & 191 Front Street, New York,

MANUFACTURERS OF

Machinery, Engine, Cylinder, and Tempering

OILS

Samples Submitted Free. Established 1822

WORCESTER MACHINE SCREW CO

AND 111 LIBERTY ST NEW YORK

MANUFACTURERS OF

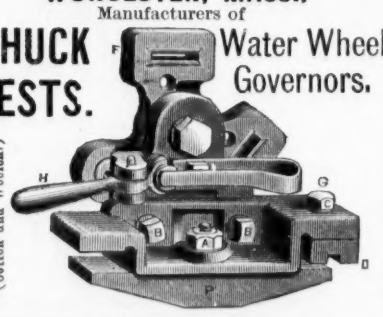
STANDARD MACHINE SCREWS.

Wright Machine Co.,

WORCESTER, MASS.,

Manufacturers of

CHUCK RESTS.



Water Wheel Governors.

Noiseless Doffer Combs, (Cotton and Woolen.)

BOSTON BLOWER CO.,

BOSTON, MASS.

Blowers and Exhausters

OF EVERY DESCRIPTION.

ESTABLISHED 1851.

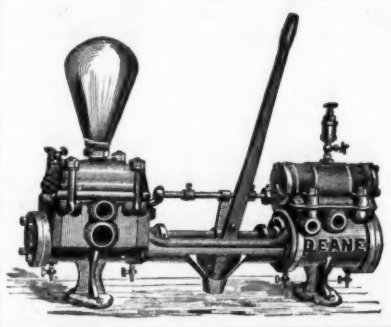
WM. B. BEMENT & SON,

PHILADELPHIA.

MANUFACTURERS OF

Lathes from 12 in. to 120 in. swing.
Planers from 20 in. to 120 in. width, and of any desired length.
Single and Double Shapers from 9 in. to 21 in. stroke.
Slotters from 6 in. to 30 in. stroke.
Vertical Drills from 24 in. to 60 in. swing.
Radial Drills from 48 in. to 144 in. radius.
Horizontal Boring Machines, three sizes.
Vertical Boring and Turning Machines from 4 ft. to 16 ft. diameter.
Punching & Shearing Machines, 20 sizes.
Bending Rolls, 6 sizes.
Steam & Hydraulic Riveters, several sizes.
Steam Hammers from 350 lbs. to 17 tons.

And a great variety of other tools, general and special.



"THE DEANE"

Steam Pumps for Every Service.

Send for New Illustrated Catalogue.

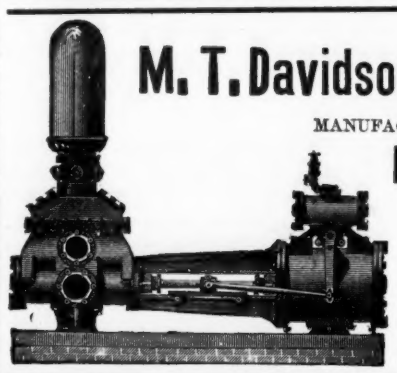
THE DEANE STEAM PUMP CO.,

HOLYOKE, MASS.

92 & 94 Liberty St., NEW YORK. 54 Oliver St., BOSTON. 226 & 228 Lake St., CHICAGO.

THE

M. T. Davidson Improved Steam Pump,



MANUFACTURED BY

Davidson Steam Pump Co.,

OFFICE & WORKS:

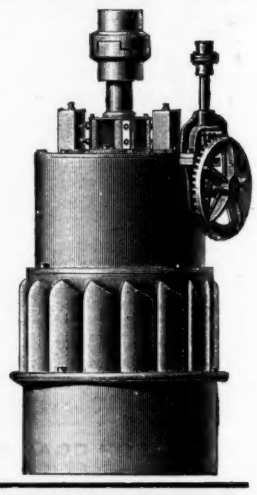
41 to 47 KEAP STREET, BROOKLYN, N. Y.

Warranted the Best Pump made for all Situations.

KELLY & LUDWIG, Agents,
49 & 51 North 7th St., Philadelphia.

THE HERCULES TURBINE

Gives more power for the same size, also better average results from full to one-half gate than any other water wheel ever made. It is moderate in cost, compact in form, and not liable to get out of order.



—BUILT BY—

THE HOLYOKE MACHINE CO.

SHOPS AT

Holyoke and Worcester, Mass.

Send for Catalogue, Circulars and Price List to either of the above places.

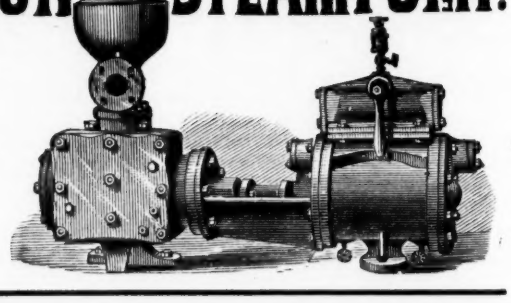
THE CAMERON STEAMPUMP.

Is the Standard of Excellence

AT HOME AND ABROAD.

THE A. S. CAMERON STEAM PUMP WORKS,

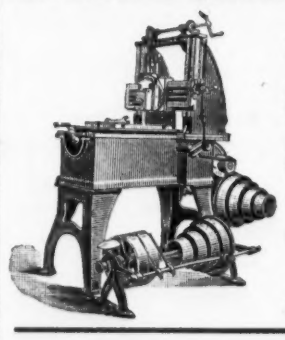
Foot of East 23d Street, New York.



PATENT RATCHET SCREW-DRIVER.

Price per set, one handle and three blades, drop forged tool steel, $3.00 All goods warranted. Send for Circular. Address: Rhodes & Hays, P. O. Box 25, Hartford, Conn.

IMPROVED CRANK PLANER



Planes 16 inches high and wide, and has 12 inch stroke.

It has power, cross and angular down feed as shown in cut, or cross feed only, if desired.

Also, quick return motion and screw running whole length under bed.

It is self-oiling in its ways.

R. A. BELDEN & CO.

Danbury, Conn.

"The Only Perfect"

BUFFALO PORTABLE FORGES.

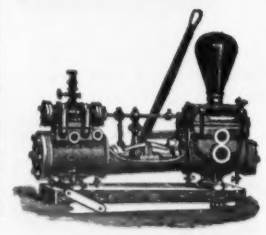
The Lightest, Strongest, most durable, easiest working, and in every way

The Best Portable Forge Made.

BUFFALO FORGE CO.

Buffalo, N. Y.

Knowles' Improved Steam Pumps;



THE STANDARD!

Steam Pumps for Every Possible Service.

SEND FOR ILLUSTRATED CATALOGUE.

KNOWLES STEAM PUMP WORKS,

86 Liberty Street, NEW YORK. | *44 Washington Street,* BOSTON.

NICHOLSON FILE CO.,

SOLE MANUFACTURERS OF

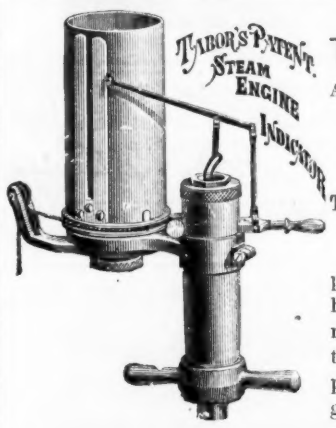
FILES AND RASPS

HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS AND SPECIALTIES.

"Nicholson File Co's" Files and Rasps, "Double Ender" Saw Files, "Slim" Saw Files, "Bacer" Horse Rasps, Handled Riffers, Machinists' Scrapers, File Brushes, File Cards, Surface File Holders, Vise File Holders, Stub Files and Holders, Improved Butchers' Steels

Manufactory and Offices at **PROVIDENCE, R. I.- U. S. A.**



TESTIMONIAL ON THE MERITS OF

Tabor's Patent Steam Engine Indicator.

AMOS WHITELY, Pres't. CHAS. A. BAUER, Sup't.

OFFICE OF

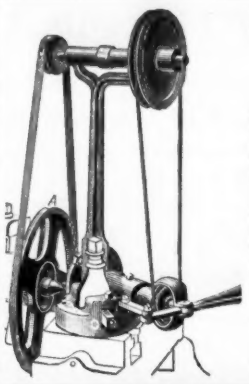
Champion Knife and Bar Co.,

SPRINGFIELD, O.

The Ashcroft Mfg. Co.,

111 Liberty St., New York.

You ask me "How I am pleased with my pair of Tabor Indicators." In reply would say that I have *tested* and *inspected* them *thoroughly*, and am now more than pleased with them. The workmanship is the *best* I ever saw. I consider the instruments about perfect. You certainly have given the Indicators a great deal of attention, to bring it to such a state of perfection. Yours very truly, CHAS. A. BAUER.



CENTRE GRINDER

For truing hardened centres and keeping true, without removing from lathe, or drawing temper.

Simple, quickly adjusted to any lathe, and does its work perfectly.

Price complete, with emery wheel, boxed, $15.

Send for circular to

Trump Bros. Mach. Co.,

Manufacturers,

Wilmington, Del., U.S.A.

C. W. LE COUNT, South Norwalk, Conn.

LE COUNT'S HEAVY STEEL DOG,

With Steel Screws. Lathe Made and Hardened.

This dog is very heavy, and is warranted not to break with any work

No. 1	3-8	in.	$ .50
" 2	1-2	"	.60
" 3	5-8	"	.70
" 4	3-4	"	.70
" 5	7-8	"	.80
" 6	1	"	.80
" 7	1 1-8	"	.95
" 8	1 1-4	"	.95
" 9	1 3-8	"	1.10
" 10	1 1-2	"	1.10
" 11	1 3-4	"	1.25
" 12	2	"	1.40
" 13	2 1-4	"	1.60
" 14	2 1-2	"	1.60
" 15	3	"	1.80
" 16	3 1-2	"	2.00
" 17	4	"	2.30
" 18	4 1-2	"	3.00
" 19	5	"	3.50

Full set, 19 Dogs, 26.35

No. 20	5 1-2	in.	4 25
" 21	6	"	5.00

Small set of 8 dogs from 3-8 to 2 ins., $7.30.

No. 14	2 1-2	in.	$1 60
" 15	3	"	1.80
" 16	3 1-2	"	2.00
" 17	4	"	2 30

Set of 12 from 3-8 to 4 inches. $15 f.o.

When ordering, state as above, whether a full set or a set of 12 or smallest of 8. Users of these dogs prefer them to any other make.

TOOLS.

Machinists, Engineers, Model Makers

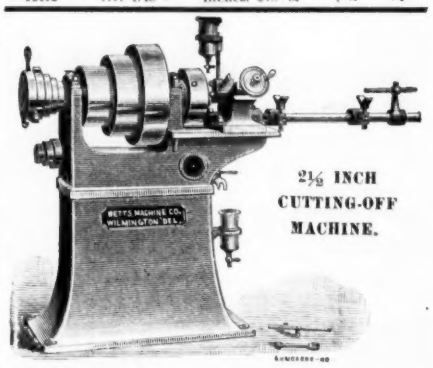
and all classes of Mechanics can find **TOOLS** to suit them at

184 to 188 WASHINGTON STREET,

BOSTON, MASS.

A. J. WILKINSON & CO.

CATALOGUES FREE.



2½ INCH CUTTING-OFF MACHINE.

BETTS MACHINE CO.

Machine Tool Builders,

Wilmington, Del.

Dowel Machines

Band Saws, Rotary and Stationary Bed Planers, and Buzz Planers, Jig Saws, Variety Moulding Machines, Pattern Makers' Lathe, Boring Machines, Waymoth Lathes.

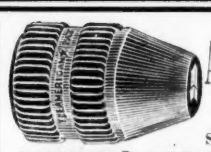
Also, a large stock of Second-hand Machinery, consisting of Machinists' Tools, Woodworking Machinery and Engines and Boilers. Send stamp for new illustrated catalogue. Just out. **BOLLSTONE MACHINE CO.**

45 Water St., Fitchburg, Mass.

Bradley's Heating Forges,

FOR COAL OR COKE,

BRADLEY & CO., - Syracuse, N. Y.



THE

American Drill Chuck

Is the cheapest 3-parallel Jaw Chuck. Price, $4.

Sold by all Tool Dealers.

BEHRMER BROS., 440 North 12th Sweet, Philadelphia, Pa.

Eureka Band Saw

We build three sizes at prices lower than an equally good Band Saw can be had elsewhere. For further information inquire of

FRANK & CO.,

176 Terrace Street,

BUFFALO, N. Y.

T. NEW'S PREPARED ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 38 John Street, New York.

H.W. JOHNS' ASBESTOS

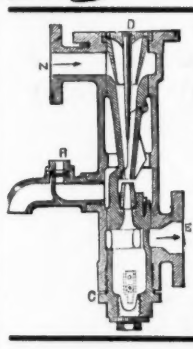
STEAM PIPE AND BOILER

COVERINGS

Steam Packing, Millboard, Sheathing, Building Felt, Liquid Paints, Roofing, &c.

DESCRIPTIVE PRICE LIST AND SAMPLES SENT FREE.

H. W. JOHNS MFG. CO., 87 Maiden Lane, N. Y.



SCHAFFER & BUDENBERG,

NEW INJECTOR

Worked by Exhaust Steam Alone.

Takes the place of Feed Pump, Heater, and by Condensing the Exhaust Steam removes the Back Pressure.

UTILIZES A POWER HERETOFORE THROWN AWAY.

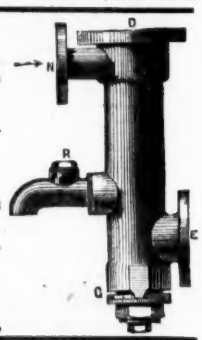
Works automatically at a steam pressure of less than half a pound. Adapted to all pressures.

For LOCOMOTIVES as well as STATIONARY ENGINES.

WORKS AT BUCKAU, — GERMANY.

DEPOT GENERAL OF THE UNITED STATES,

W. HEUERMANN, 40 JOHN ST., NEW YORK.



AKRON IRON COMPANY,

AKRON, O.

PATENT HOT POLISHED SHAFTING.

Superior to any shafting in market for the following reasons, viz.: 1st.—It is perfectly straight and round. 2d.—It can be rolled accurately to any desired gauge. 3d.—It has the beautiful blue finish of Russia Sheet Iron, rendering it less liable to rust or tarnish than shafting of the ordinary finish. 4th.—It will NOT SPRING or WARP IN KEY SEATING like most of the other manufactured shafting sold in the market, and, as a consequence, is admirably adapted for LINE AND COUNTER SHAFTING. 5th.—The surface is composed of MAGNETIC OXIDE OF IRON, forming a superior journal or bearing surface. 6th – It is made of superior stock.

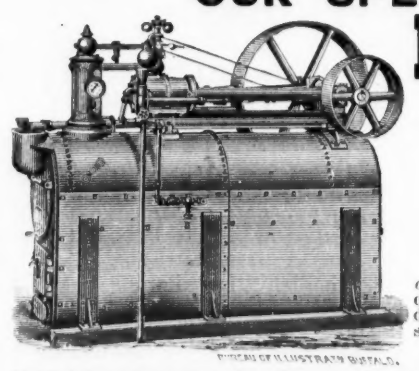
Sizes made from ⅞ to 3⅛ inches, advancing by sixteenths. Price lists, with references and other information, furnished on application to

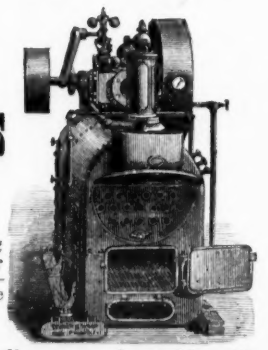
AKRON IRON CO., Akron, O., Sole Manuf'rs.

Or **E. P. BULLARD, 14 Dey Street, New York,** General Eastern Agent.

OUR SPECIALTY IS Economical Powers

Of 5 to 25 H. P.





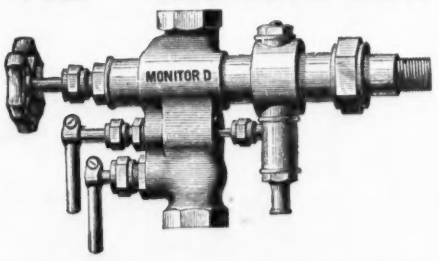
Of **1,900** in use, *not one* has Exploded, or can show a rupture—due to their absolute safety and simplicity.

In finish and construction these engines are admirable, and will compare favorably with those of higher price. Each is built on a perfect system of duplicating parts—a point of convenience to customers. Correspondence solicited, and Catalogues mailed to any address.

SKINNER & WOOD, Manufrs.

ESTABLISHED 1867. ERIE, PA.

THE "MONITOR."



A NEW LIFTING & NON-LIFTING INJECTOR.

BEST BOILER FEEDERS IN THE WORLD.

FRIEDMANN'S Patent Ejectors.

OR

WATER ELEVATORS,

For Conveying Water and Liquids

Pat. Oilers & Lubricators, &c.

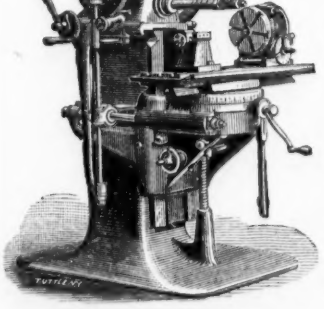
NATHAN & DREYFUS.

Patentees and Manufacturers,

92 and 94 Liberty Street

NEW YORK.

Send for Illustrated Catalogue.



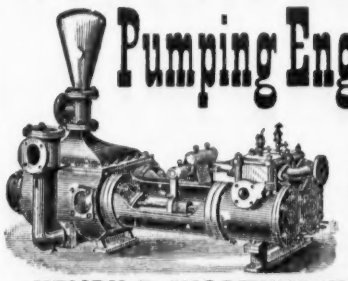
New Heavy Universal Milling Machine.

Correspondence solicited.

MANUFACTURED BY

C. E. LIPE, Syracuse, N. Y.

WORTHINGTON Pumping Engines



AND STEAM PUMPS.

HENRY R. WORTHINGTON,

239 Broadway, New York.

Kilby St., Boston. | 707 Market St., St. Louis

Send for Latest Catalogue.

IMPROVED HOISTING ENGINES

Manufactured by the

LIDGERWOOD MF'G CO.

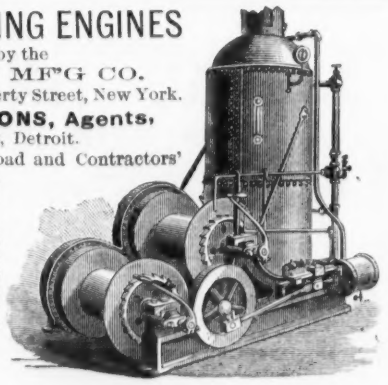
Offices and Salesrooms: 96 Liberty Street, New York.

C. S. WORMER & SONS, Agents,

Chicago, St. Louis, Detroit.

Specially adapted for Railroad and Contractors' uses, Pile-driving, Bridge and Dock Building, Excavating, &c. Single or double cylinders with single or double improved friction drums with or without Boilers.

ALL SIZES.



THE HANCOCK INSPIRATOR

The Standard for Stationary, Marine, Locomotive

AND ALL CLASSES OF BOILERS.

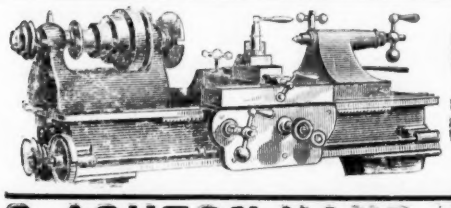
Over 40,000 in Use.

Adopted by the Largest Mills and Manufactories.

Send for Circulars to

THE HANCOCK INSPIRATOR CO.

34 BEACH STREET, BOSTON.



BIRKENHEAD'S

New Single Head Lathes.

Hollow Spindle, Improved Stop Motion, 14 inch Swing 4 to 8 feet beds. Also, 5 foot **Hand Lathes**, and **Engine Lathes** with screws and back gears, or back geared lathes without screw. Send for circular.

JOHN BIRKENHEAD,

MANSFIELD, MASS., U. S. A.

S. ASHTON HAND,

Toughkenamon, Chester Co., Pa.,

MAKER OF FIRST-CLASS

ENGINE LATHES

Is now in position to put on the market

14" ENGINE LATHES OF NEW DESIGN

guaranteed to be equal in material, design and workmanship to the best ever offered.

MACHINERY FOR REDUCING AND POINTING **WIRE**

by compression or swaging **COLD.** Machines manufactured under patents owned by Miller, Metcalf & Parkin, Pittsburgh, Pa. For machines or information, address

S. W. GOODYEAR,

WATERBURY, CONN.

SHEPARD'S CELEBRATED

$60 Screw Cutting Foot Lathe.

Foot and Power Lathes, Drill Presses, Scrolls, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers. Send for catalogue of outfits for amateurs or artisans. Address,

H. L. SHEPARD & CO.,

341 & 343 WEST FRONT STREET,

CINCINNATI, OHIO.

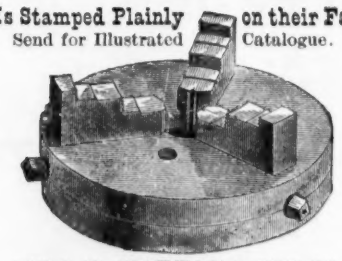
They are not **Horton Chucks**

UNLESS OUR TRADE MARK

"The Horton Lathe Chuck,"

Is Stamped Plainly on their Face.

Send for Illustrated Catalogue.



THE E. HORTON & SON CO.,

Canal St., Windsor Locks, Ct., U. S. A.

THE

GARDNER

COMPENSATION

GOVERNOR

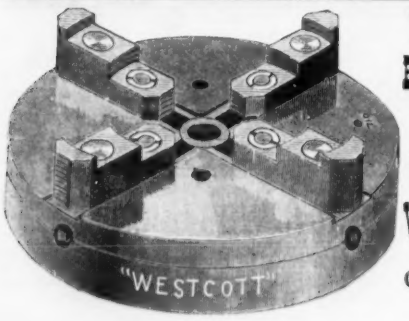
OVER 25,000 IN USE.

Unequaled for Accuracy, Safety, Convenience, Durability, Workmanship, and Design. Address,

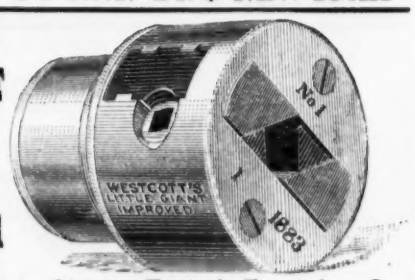
ROBERT W. GARDNER,

QUINCY, ILL.

New York Agents, JAMES BEGGS & CO., No. 9 Dey St.



THE BEST IN THE World



Oneida Steam Eng. & Foundry Co.,

ONEIDA, N. Y.

PECK'S PAT. DROP PRESS.

BLAST FORGES.

STEEL & IRON DROP FORGINGS.

Drop Dies and Special Machinery.

BEECHER & PECK, NEW HAVEN CONN.

D. E. WHITON,

Manufacturer of

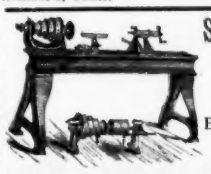
Gear Cutters, Centering Machines,

And Lathe and Drill Chucks in great variety.

FACTORIES AT WEST STAFFORD & NEW LONDON, CONN.

OFFICE AT NEW LONDON.

☞ All Chucks for repairs should be sent to West Stafford, Conn.



Superior 10, 12 & 16 in.

SPEED LATHES.

Built by **FAY & SCOTT,**

DEXTER, MAINE.

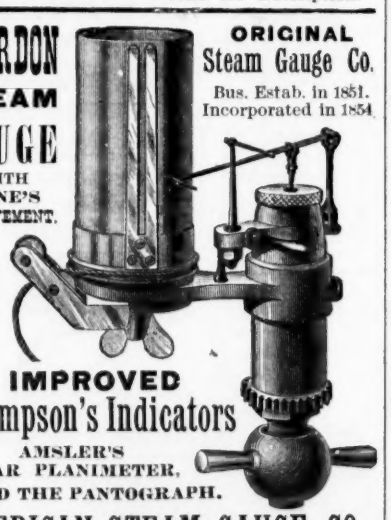
Send for Description.

BOURDON STEAM GAUGE WITH LANE'S IMPROVEMENT.

ORIGINAL

Steam Gauge Co.

Bus. Estab. in 1851. Incorporated in 1854.



IMPROVED

Thompson's Indicators

AMSLER'S POLAR PLANIMETER, AND THE PANTOGRAPH.

AMERICAN STEAM GAUGE CO.,

Sole Manufacturers,

36 Chardon Street, Boston, Mass.

Send for New Illustrated Price List and name this paper.

J. C. BLAISDELL, Pres.

E. BURT PHILLIPS, Treas. H. K. MOORE, Sup't

HOW TO KEEP **BOILERS** CLEAN

FREE Book Sent To Any Address

By JAS. F. HOTCHKISS, 84 John St. N.Y.

CHARLES MURRAY

ENGRAVER ON WOOD

58 ANN ST. NEW YORK.

HARRISON BOILER. "THE SAFEST"

Adapted for all Steam Purposes.

Merits have been proved during **ten to fifteen years constant use** by such concerns as Cheney Bros., South Manchester, Conn.; Wallace & Sons, Ansonia, Conn.; Wampanoag Mills, Weetamoe Mills, Sagamore Mills, Fall River, Mass.; Sears' Building, Boston, Mass.; Brown & Sharpe Mfg. Co., Providence, R. I.; A. T. Stewart & Co., Tiffany & Co., New York; Stevens' Institute, Hoboken, N. J.; Matthiessen & Wiecher's Sugar Refinery, Jersey City, N. J.; Wm. Sellers & Co., S. S. White, Daniel Allen, Jno. Gardiner & Co., Phosphor-Bronze Smelting Co., Henry Bower, Evening Bulletin, Saturday Night, Philadelphia, Pa., and numerous others.

Franklin Institute Medal awarded for SUPERIORITY OF EVAPORATIVE EFFICIENCY, ECONOMICAL CAPACITY FOR GENERATING STEAM AND DYNAMIC VALUE OF STEAM. Easily transported on mule back. Send for Descriptive Catalogue.

HARRISON BOILER WORKS

Germantown Junction, Philadelphia, Pa.

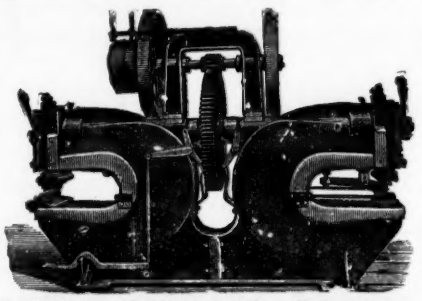
THE

Slate Sensitive Drill.

Adapted to rapid work with small drills. Its extreme sensitiveness prevents clogging and breakage of drills. Has a swinging table with attachment for center drilling. Instantly adjustable to different lengths of work. Over 200 already in use. Send for circular

DWIGHT SLATE,

HARTFORD, CONN



POWER PUNCHES, SHEARS HAMMERS.

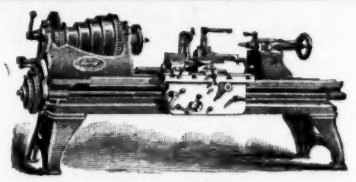
We make over 100 sizes of Punches and Shears. Double and Single, varying from 500 to 35,000 pounds in weight, and adapted for every variety of work The Double machines are equal to two Single ones as each side is worked independently. Also

ADJUSTABLE HELVE CUSHIONED HAMMERS

Of all sizes, unequalled for efficiency and durability

The Long & Allstatter Co.,

HAMILTON, OHIO.



New Haven Manf'g Co.

NEW HAVEN, CONN.

Iron-Working Machinery,

PLANERS, SHAPERS, DRILLS.

Gage's Self-Tightening **DRILL CHUCK**

No key or wrench required.

Holds from 0 to 3-8 and 0 to 1-2.

L. B. RUSSELL, 96½ Summer St., Boston, Mass.

S. A. SMITH, Agent for the West,

154 LAKE STREET, CHICAGO, ILL.

CLEVELAND TWIST DRILL COMPANY, COX & PRENTISS,

24 & 26 West St., Cleveland, O

SCHUTTE & GOEHRING, Manufacturers,

KORTING DOUBLE TUBE INJECTOR,

THE LEADING BOILER FEEDER.

OPERATED BY ONE HANDLE.

Will Lift Hot Water through Hot Suction Pipe. Guaranteed to Work under all conditions.

SEND FOR CIRCULAR.

OFFICES AND WAREROOMS:

12th and Thompson Street, Philadelphia.
A. F. UPTON, 7 Oliver St., Boston.
POND ENGINEERING CO., 709 Market St., St. Louis
C. E. KENNEDY, 458 Blake St., Denver, Col.
G. R. LOMBARD & CO., 1026 Fenwick St., Augusta, Ga.
A. ALLER, 109 Liberty St., New York.
M. C. BULLOCK MFG. CO., 84 Market St., Chicago.
GEORGE A. SMITH, 1419 Main St., Richmond, Va.
H. P. GREGORY & CO., 2 California St., San Fran'co

UPRIGHT DRILL PRESS $75.00
KEY SEATING MACHINE $55.00
SEND FOR CATALOGUE TO
W. P. DAVIS
NORTH BLOOMFIELD, ONT. CO. N.Y.

Patent Interlocking Grate Bars.

These bars are in use in over 10,000 different furnaces, are unequalled for durability and economy, and adapted to all kinds of fuel. Descriptive circular sent on application.

SALAMANDER GRATE BAR CO.,

110 LIBERTY ST., NEW YORK.

SCROLL SAWS!

The "CHALLENGE" and "RIVAL" are the finest Foot power Scroll Saws in the world, with or without Lathe attachment. **Price, $10 to $25.**

New Catalogue free. Address,

SENECA MANUFACTURING CO,

Seneca Falls, N. Y., U. S. A.

PATENT

Self-Oiling Loose Pulley,

Fully tested by several years use and found reliable.

Satisfactory Results Guaranteed, if Directions are followed.

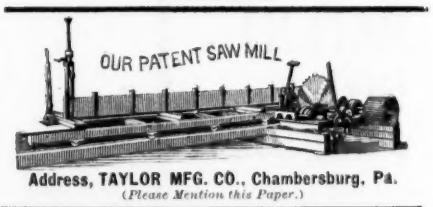
ORDERS FILLED FOR PULLEYS

From 6 in. to 20 in. Diameter.

LANE & BODLEY CO.,

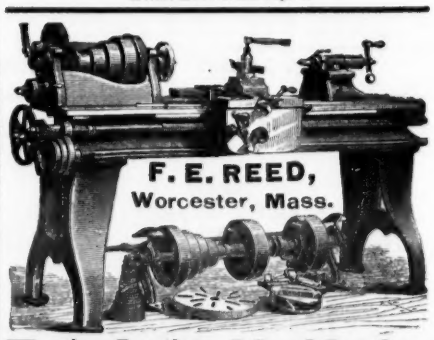
Cincinnati, - - - - - Ohio.

MANUFACTURERS SHAFTING, ENGINES, BOILERS, SAW MILLS, AND GENERAL MACHINERY.



Address, TAYLOR MFG. CO., Chambersburg, Pa.

(Please Mention this Paper.)



F. E. REED,

Worcester, Mass.

Engine Lathes, Hand Lathes,

SLIDE RESTS and PLANER CENTERS.

MORSE TWIST DRILL & MACHINE COMPANY, NEW BEDFORD, MASS.

Sole Manufacturers of Morse Patent Straight-Lip Increase Twist Drill.

SOLID AND SHELL REAMERS, BEACH'S PATENT SELF-CENTERING CHUCK, BIT STOCK DRILLS.

Drills for Coes, Worcester, Hunter and other Hand Drill Presses. Drill Grinding Machines, Center and Adjustable Drill Chucks, Taper Reamers, Milling Cutters, and Special Tools to order.

All Tools Exact to Whitworth Standard Gauges.

GEO. R. STETSON, Sup't. EDWARD S. TABER Pres't and Treas.

A fire-proof non-conductor and deafener. 2½ cents per cubic ft. at wholesale prices. Sample and circulars free by mail.

U. S. Mineral Wool Co.

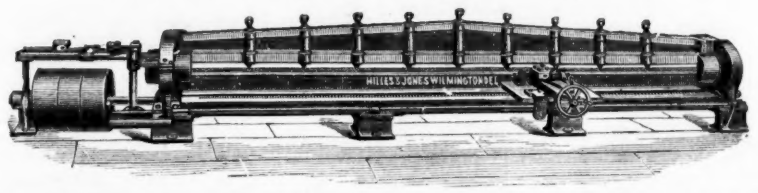
22 Cortlandt Street, N. Y.

MINERAL WOOL.

Fibre Magnified.

BOILER PLATE PLANER.

Will Plane any Length of Plate.



Tools cut both ways and have independent adjustment. Table acts as a gauge for setting the Plate. Driven by a Steel Screw, which is supported its entire length so that it cannot be bent or sprung.

HILLES & JONES, Wilmington, Del.

THOMPSON & HOLMES CHUCKS

MAKERS OF ALL KINDS & SIZES.

Send for Catalogue to

JAMES D. FOOT, Sole Agent,

No. 101 CHAMBERS STREET, NEW YORK.

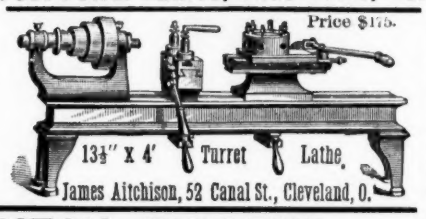
W. C. YOUNG & CO., Worcester, Mass.

Manufacturers of

ENGINE LATHES, HAND LATHES,

Foot Power Lathes, Slide Rests, &c.

Price $175.

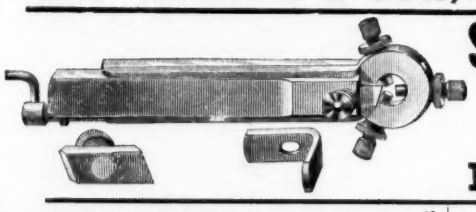


13½" x 4' Turret Lathe.

James Aitchison, 52 Canal St., Cleveland, O.

FRICTION CLUTCH PULLEYS AND CUT-OFF COUPLINGS,

JAS. HUNTER & SON, North Adams, Mass.

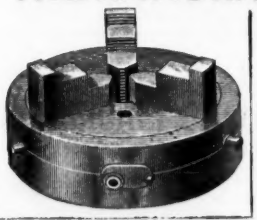


SMITH LATHE TOOL

For Light Work, Turning Small Rods, Tap Making, and for all work where Accuracy is Essential.

PRATT & CANDEE, HARTFORD, CONN.

"THE NATIONAL CHUCK"



WARRANTED SUPERIOR TO ANY CHUCK IN THE MARKET

NATIONAL M'F'G CO. NEW HAVEN, CONN

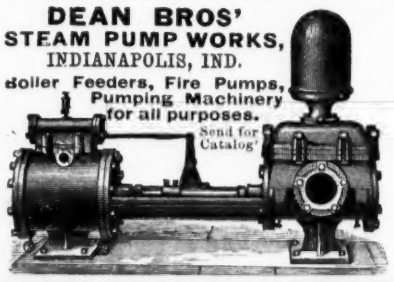
DEAN BROS'

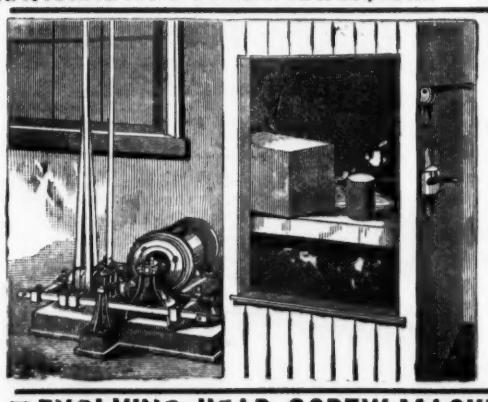
STEAM PUMP WORKS,

INDIANAPOLIS, IND.

Boiler Feeders, Fire Pumps, Pumping Machinery for all purposes.

Send for Catalog





Tewksbury Automatic Elevator Co.

MANUFACTURERS OF

PACKAGE AND LIGHT FREIGHT

ELEVATORS

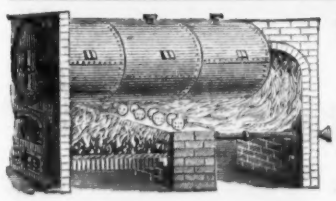
60 Temple Court, Beekman Street,

Send for Circulars NEW YORK

REVOLVING HEAD SCREW MACHINES WITH PATENT AUTOMATIC WIRE FEED.

Of Extra Strength and Power, of a Superior Design and Finish.

WICACO SCREW & MACHINE WORKS, 712 Cherry St., Philadelphia, Penn.



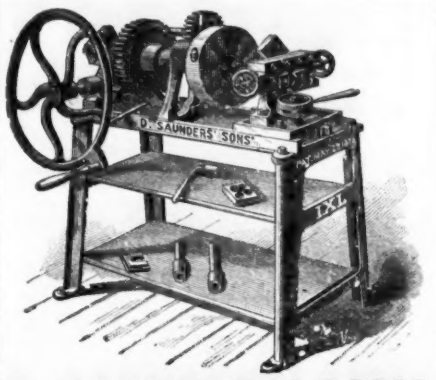
Universal Patent Furnace,

Saves fuel and increases Boiler capacity.

CORRUGATED GRATE BARS,

Suitable for Furnace Coal, Screenings and all kinds of Waste Fuel.

JAMES MAHONY, 73 Astor House, New York.



D. SAUNDERS' SONS

MANUFACTURERS OF THE ORIGINAL

Trade **I.X.L.** Mark.

Pipe Cutting AND Threading Machine.

BEWARE OF IMITATIONS.

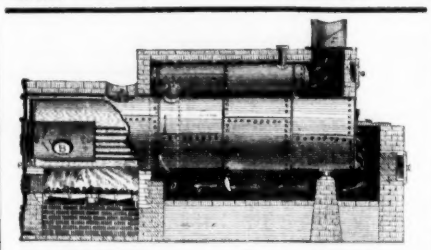
None Genuine without our Trade-Mark and Name.

STEAM AND GAS FITTERS' HAND TOOLS,

PIPE CUTTING & THREADING MACHINES

For Pipe Mill use a Specialty.

Send for Circulars. YONKERS, N. Y.



BRIDGEPORT BOILER WORKS,

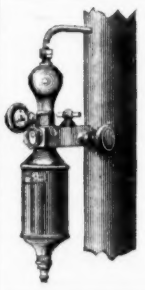
BRIDGEPORT, CONN.

LOWE & WATSON, Proprietors,

MANUFACTURERS OF

The Lowe Patent Tubular Boiler, with and without Superheating Drums. Fourteen years' use proves them the most durable and reliable boiler known. Gives dry steam. The process for combustion of the gases is in the construction and setting. Burns any fuel; obtains as much result from it as any boiler or setting with no more cost, and greater durability.

Send for descriptive Circular.



SWIFT'S AUTOMATIC

LUBRICATOR

FOR STEAM ENGINES.

POSITIVE FEED,

FLASH "SIGHT."

NO EXTERNAL OR INTERNAL PIPES,

NO GLASS TUBES, OR LOOSE JOINTS.

ALLEN W. SWIFT,

Elmira, N. Y.

THE BRAYTON PETROLEUM ENGINE CO.

50 Federal St.

BOSTON, MASS.

No Boiler. No Coal. No Steam. No Ashes. No extra Insurance. No Engineer. No Danger. No Explosion. No Fires. Almost no Attendance.

SAFETY! ECONOMY! CONVENIENCE!

Expense Ceases when Engine is Stopped.

When power is required at intervals it is the cheapest Motor known.

JOSEPH B. MATTHEWS,

AUTOMATIC ENGINES, BALTIMORE, MARYLAND.

P. BLAISDELL & CO.,

Manufacturers of

Machinists' Tools,

WORCESTER, MASS.

THE ALLIGATOR WRENCH,

Teeth cut diagonally. Grips Round Iron or Pipe.

Patented August 31, 1875.

AMERICAN SAW CO., Trenton, N. J.

STEWART'S READY ROOFING

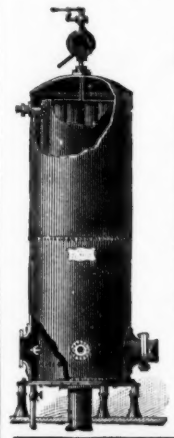
For STEEP and FLAT ROOFS of all kinds; can be applied by ordinary workmen at ONE THIRD the cost of TIN. Send for a sample and our circular which gives full directions how to apply your own roof; also how to repair leaky roofs of all kinds. Address,

W. H. STEWART,

74 Cortlandt St., New York.

THE BARAGWANATH

S. J. F. W. H. & P.



Manufactured by the

Pacific Boiler Works

OF CHICAGO,

Has received unparalleled success in the West during the past five years. The most distinguished feature about this heater is its steam jacket, thus enabling it to accomplish the unprecedented result of almost invariably delivering the feed water several degrees above the boiling point, reducing back pressure on the engine, and keeping the boilers reasonably clean.

BENJ. F. KELLEY,

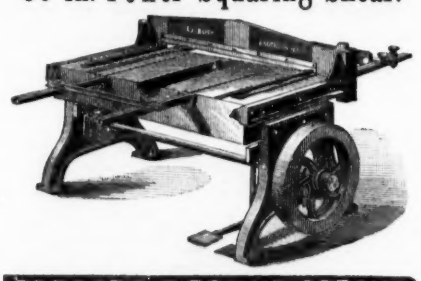
20 CORTLANDT ST., NEW YORK.

Gen. Eastern Agent.

E. W. BLISS.

BROOKLYN, NEW YORK.

36 in. Power Squaring Shear.

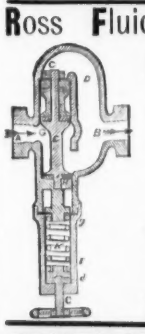


PRESSES, DIES AND SPECIAL MACHINERY FINE ENGINE LATHES AND SHAPERS.

Ross Fluid Pressure Reducer,

For Steam, Water, Air & Gas.

Automatically reduces the pressure in pipes to any desired extent.



Manufactured by the

Ross Valve Co.

652 RIVER ST., TROY, N. Y.

Simplest! Cheapest! Best!

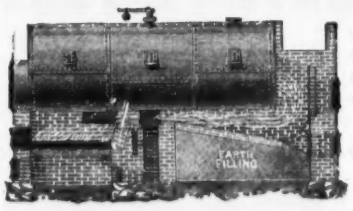
SEND FOR CIRCULAR.

For full description of this Valve see AMERICAN MACHINIST issue of March 11, 1882.

"THE SWEETLAND CHUCK".

SWEETLAND & CO. NEW HAVEN, CONN.

JARVIS PATENT FURNACE FOR SETTING STEAM BOILERS.



"Economy of Fuel, with increased capacity of steam power. Like the Siemens Process, it utilizes the gases with hot air on top of the fire. Burns all kinds of waste without a blast, including screenings, wet peat, wet hops, sawdust, logwood, chips, slack coal and wet bagasse without drying."

A. F. UPTON, General Ag't,

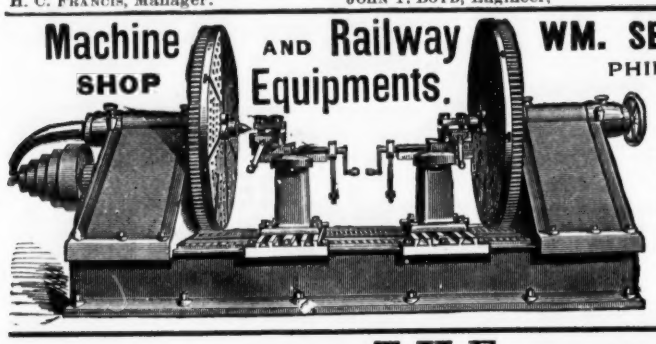
Send for Circular. 7 Oliver St., (P. O. Box 3401,) Boston, Mass.

BERTON & NICKEL, New York Agents, No. 422 E. 23d St.

POND ENGINEERING CO., Western Agents, 709 Market St., ST. LOUIS, and 130 West Second Street, CINCINNATI, Ohio.

KENSINGTON ENGINE WORKS, (Limited,)
Vienna and Beach Sts., - - - PHILADELPHIA,
ENGINEERS and MACHINISTS,
MANUFACTURERS OF **BUCKEYE AUTOMATIC ENGINES**
For Middle and South Atlantic States,
SPECIAL MACHINERY BUILT TO ORDER.
H. C. Francis, Manager. John T. Boyd, Engineer, Wm. L. Simpson, Supt.

Machine Shop and Railway Equipments.



WM. SELLERS & CO.
PHILADELPHIA.
Shafts, Couplings, Hangers, Pulleys, Mill Gearing, etc., Lathes, Planers, Drills, Shapers, Bolt Cutters, Tweedell's Hydraulic Riveters, etc. Railway Turntables and Pivot Bridges. Gifford Injectors, Sellers' Improvements. New Patterns. Simple. Effective.
New York Office,
79 LIBERTY ST.

THE
GALLOWAY BOILER.
Safety—Economy in Fuel—Low Cost of Maintenance—Dry Steam without Superheating.
Correspondence Solicited. Address,
EDGEMOOR IRON CO., Wilmington, Del.

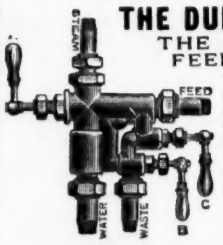
DETRICK & HARVEY,
BALTIMORE, MD.
SINGLE POST PLANERS,
HEAVY MILLING MACHINES.
MACHINERY FOR
Manufacture of Tinware,
ETC.
SEND FOR CATALOGUE.

UPRIGHT DRILLS
16 to 60 Inches Swing.
BORING AND TURNING MILLS
To Swing, 48, 66 & 84 in.
H. BICKFORD,
Cincinnati, Ohio.

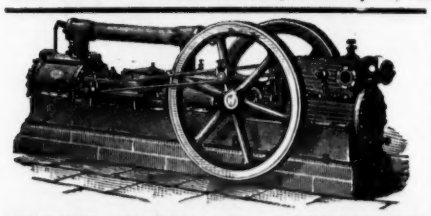
TAPS & DIES VISES TOOLS CHUCKS STILLS TWIST DRILLS MACHINE SCREWS LATHES FILES STEEL TOOLS & STUBS
TOOLS for Machinists, Amateurs, Jewellers, Model Makers, Blacksmiths, Carpenters, Coachmakers, etc.
Send 20 cts. for new Metal Worker's Catalogue, 300 Pages. Wood Worker's Catalogue free.
TALLMAN & McFADDEN, Philadelphia, Pa.

SHAPING MACHINES.
6 in. and 8 in. Hand and Power.
SEND FOR CIRCULAR.
BOYNTON & PLUMMER, Worcester, Mass.

THE DUPLEX INJECTOR,
THE BEST BOILER FEEDER KNOWN.



Not liable to get out of order. Will lift water 22 feet. Always delivers water *hot* to the boiler. Will start when it is hot. Will feed water through a heater. Manufactured and for sale by
JAMES JENKS,
Detroit, Mich.



STEAM PUMPS, AIR COMPRESSORS, Friction Hoisting Engines, Vacuum Pumps and Condensers, General Machinery, Steam Engines. Capacity to bore cylinders 110 in. diameter and turn Fly Wheels of 34 feet.
The Norwalk Iron Works Co.
SOUTH NORWALK, CONN.

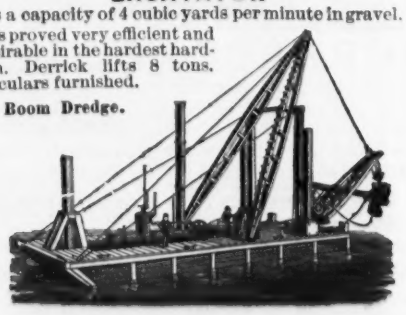
IRON WORKING
MACHINERY
FOR IMMEDIATE DELIVERY.
16 in. Lathes, 5 and 6ft. Beds.
One 50 inch Gap Chucking Lathe.
One 14 ft.—26 in. Engine Lathe.
A. M. POWELL & CO.,
WORCESTER, MASS.

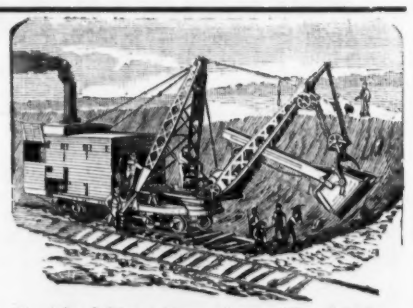
ECLIPSE PORTABLE & TRACTION ENGINES

Stationary Engines.
Iron and Steel Boilers.
Portable Circular Saw Mills.
Threshers & Separators.
Send for Catalogue and say where you saw this.
FRICK & CO.
Waynesboro, Franklin Co., Pa.

Fox, Turret and Speed Lathes
—AND—
Swivel Head Engine Lathes,
(18 and 26 in. from new patterns)
GEORGE GAGE, WATERFORD, N. Y.

DREDGES
guaranteed to excavate 50 per cent. more material from hard bottom than any other machine.
EXCAVATOR
has a capacity of 4 cubic yards per minute in gravel.
Has proved very efficient and desirable in the hardest hard-pan. Derrick lifts 8 tons. Circulars furnished.
Boom Dredge.

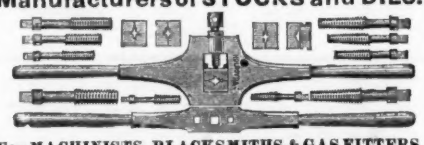




Combined Steam Excavator and Derrick Car.
OSGOOD & MACNAUGHTON,
ALBANY, N. Y., Patentees,
Successors to RALPH R. OSGOOD, Troy, N. Y.

The Southwark Foundry & Machine Co.
ENGINEERS AND MACHINISTS,
430 Washington Avenue, Philadelphia.
Blowing Engines and Hydraulic Machinery,
SOLE MAKERS OF THE
PORTER-ALLEN AUTOMATIC CUT-OFF STEAM ENGINE.

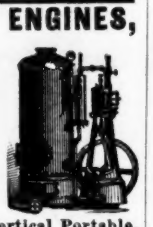
HOLROYD & CO., Waterford, N. Y.
Manufacturers of STOCKS and DIES.



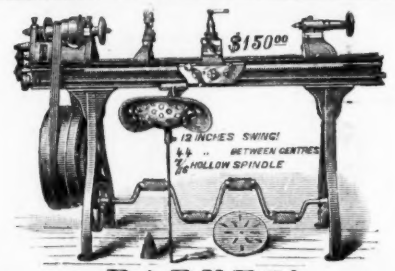
For MACHINISTS, BLACKSMITHS & GAS FITTERS.

PAYNE'S AUTOMATIC ENGINES,
Established 1840.

Spark Arrester.

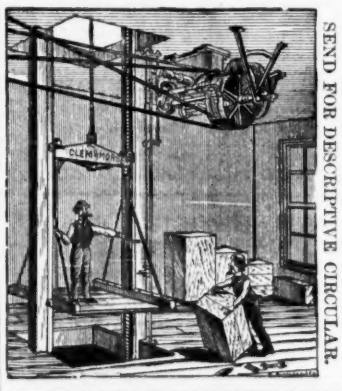


Vertical Portable.
Reliable, durable and economical, *will furnish a horse power with ⅛ less fuel and water than any other engine built*, not fitted with an automatic cut-off. Send for illustrated Catalogue c. c., etc. for information and prices.
B. W. PAYNE & SONS,
Box 1230. CORNING, N. Y.



BARNES'
Patent Foot and Steam Power Machinery. Complete outfits for Actual Work-shop Business. Lathes for Wood or Metal. Circular Saws, Formers, Mortisers, Tenoners, etc., etc. Machines on trial if desired. Descriptive Catalogue and Price List free.
W. F. & JOHN BARNES, 1995 Main St., ROCKFORD, ILL.

CLEM & MORSE,

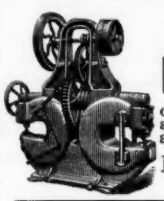


413 Cherry Street, Philadelphia.
108 Liberty Street, New York.
39 Fifth Avenue, Pittsburgh.
Wick Block, Cleveland.
SEND FOR DESCRIPTIVE CIRCULAR.

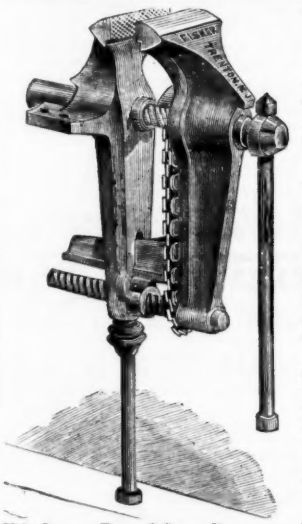
SCHUTTE & COEHRING,
Manuf's of
KORTING CONDENSER.
For Steam Engines and Pumps.
Requires no Air Pump and no foundations. Only 15 ft. height of water required from level of water supply to discharge pipe, instead of 34 ft., whether above or below engine cylinder. Has fewer parts, and is lower in price than any other condenser. Send for circular giving full information.
Offices and Warerooms:
12th and Thompson Sts., Philadelphia.
A. ALLER, 109 Liberty St., New York
A. F. UPTON, 7 Oliver St., Boston.

MACHINE MOULDED
Spur and Bevel
GEARS
Pulley Castings, &c.
Special Inducements to the Trade.
List mailed on application.
POOLE & HUNT,
Baltimore, Md.

THE HENDEY MACHINE CO.
TORRINGTON, CONN.
15, 24 and 30 in. Shapers.
4 ft. x 16 in., 5 ft. x 20 in., 6 ft. x 24 in., 6 ft. x 26 in., 8 ft. x 26 in. and 8, 10, and 12 ft. x 30 in. Planers.
5 ft. x 12 in., 6 ft. x 12 in., 6 ft. x 15 in. and 8 ft. x 15 in. Hollow Spindle Hand Lathes.
AMATEURS' HAND PLANERS, SHAPER AND PLANER CENTERS, SLIDE RESTS, &c.



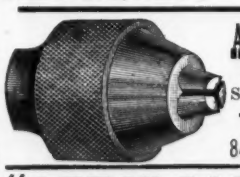
FOR A
COMBINED
Punch and Shears
of beautiful design, of great strength and capacity, and thoroughly reliable, address
Lambertville Iron Works,
LAMBERTVILLE, N. J.



Largest size has 8 inch Jaw—opening 10 inches, with 2 inch Lever. Five smaller sizes, at $7 to $27. The only Parallel Vise that will stand heavy work. Send for circular to
EAGLE ANVIL WORKS,
TRENTON, N. J.
Fisher Double Screw Leg Vise,
WARRANTED
Stronger Grip than any other Vise.
ALWAYS PARALLEL AND CANNOT BE BROKEN.

J. A. FAY & CO., CINCINNATI, Ohio, U. S. A.
BUILDERS OF IMPROVED
WOOD-WORKING MACHINERY

Embraces nearly 400 Machines for
Planing & Matching,
Surfacing, Moulding, Tenoning, Mortising, Boring, and Shaping, &c.
Variety and Universal
WOOD WORKERS.
Band, Scroll and Circular Saws, Resawing Machines, Spoke and Wheel Machinery, Shafting, Pulleys, etc. All of the highest standard of excellence.
W. H. DOANE, Pres't. D. L. LYON, Sec'y.



Almond Drill Chuck.
Sold at all Machinists' Supply Stores.
T. R. ALMOND,
84 Pearl St., Brooklyn, N.Y.

"OTTO" GAS ENGINE.
OVER 8000 IN USE.

Manufactured by
SCHLEICHER, SCHUMM & CO.,
33d and Walnut Streets, Philadelphia.

THE HARTFORD AUTOMATIC CUT-OFF ENGINE.

Built for Heavy and Continuous Work, and adapted to any required speed

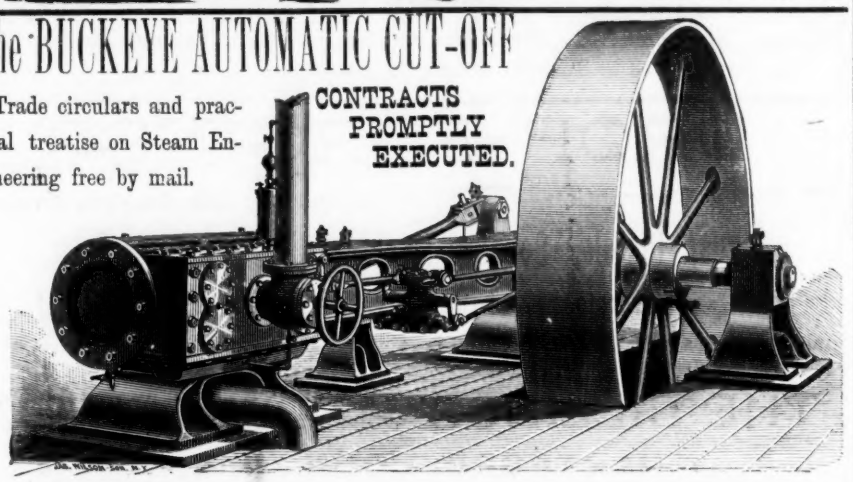
Close regulation and best attainable Economy of Fuel Circular and Practical Treatise on Steam Engineering sent on application.

THE HARTFORD ENGINEERING COMPANY,
HARTFORD, CONN.
New York Office,
Rooms 72 and 73, Astor House

The BUCKEYE AUTOMATIC CUT-OFF

Trade circulars and practical treatise on Steam Engineering free by mail.

CONTRACTS PROMPTLY EXECUTED.



These Engines are carefully constructed for heavy and continuous duty, at medium or high rotative speeds. Highest attainable economy in consumption of steam, and superior regulation guaranteed.

Address, BUCKEYE ENGINE CO., Salem. Ohio.

Steam & Drop Pile Drivers.

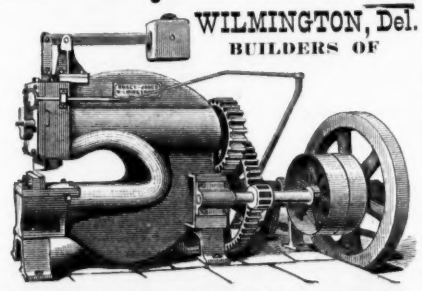
Skinner's Patent Steam Pile Hammer, automatic; very effective; simple and durable, with recent improvements.

VULCAN IRON WORKS,
CHICAGO, ILLINOIS.

20 INCH SWING ENGINE LATHES.
F. C. & A. E. BOWLAND,
New Haven, Conn.

The Pusey & Jones Co.,

WILMINGTON, Del.
BUILDERS OF



STEAM ENGINES,

Boilers, Tanks, Machinery for Rolling Mills, Punches, Shears, Riveters, Angle Iron Cutters, Cranes, and heavy Iron Work generally.

E. P. BULLARD,

Iron Working Machine Tools

NEW YORK AGENT FOR

Brown & Sharpe Manufacturing Co.
Hendey Machine Co.
Bradley Cushioned Hammers.
Prentice Bros. Drills.
Ames Manufacturing Co.'s Lathes, Planers, Drills, Milling Machines, etc,
Bridgeport 16 inch Engine Lathe.
" 21 " " "
" 16 x 16 x 3½ Planer.
Secor Screw Machines.
Akron Iron Co.'s Hot Polish Shafting.

Full Line of Machinery.

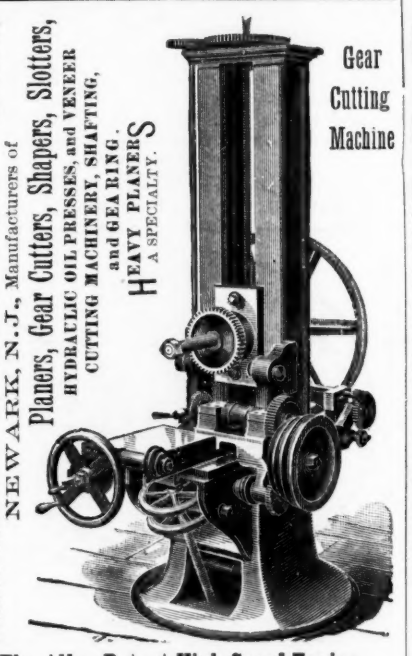
Write full particulars of what is wanted.

14 DEY STREET,
NEW YORK

HEWES & PHILLIPS' IRON WORKS,

NEWARK, N. J., Manufacturers of
Planers, Gear Cutters, Shapers, Slotters,
HYDRAULIC OIL PRESSES, and VENEER CUTTING MACHINERY, SHAFTING, and GEARING.
HEAVY PLANERS A SPECIALTY.

Gear Cutting Machine



The Allen Patent High Speed Engine,

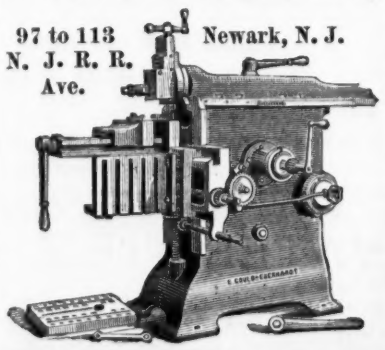
Both Condensing and Non-Condensing. High economic duty and fine regulation guaranteed. Tubular Boilers and Steam Fittings.

The Cheapest. The Simplest Made A perfect Indicator at all Times. Nothing to wear out. Only Two Valves. Feeds any lubricant from suet to thinnest oil. Under perfect control of Engineer; it can't control him. Saves Oil, Coal, and wear and tear.

A. P. & F. S. GROVES,
Sole Proprietors,
28 South Delaware Avenue, Philadelphia.
AGENTS WANTED.

E. GOULD & EBERHARDT,

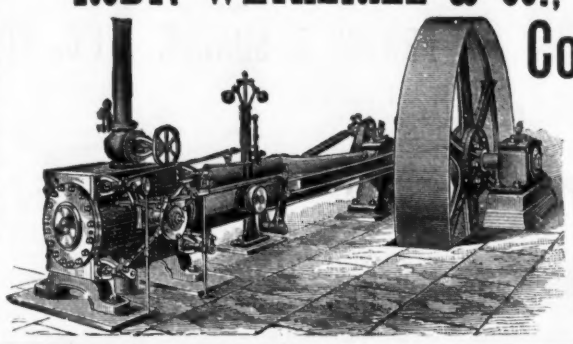
97 to 113 N. J. R. R. Ave. Newark, N. J.



Patent Shapers,

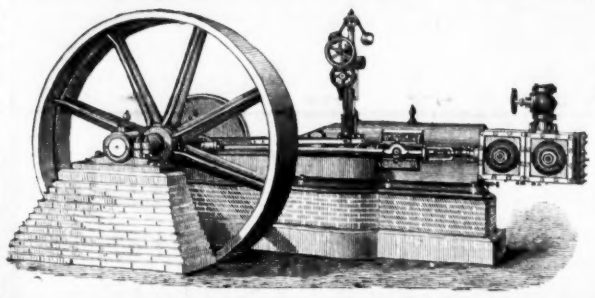
QUICK Adjustable Stroke.
Can be CHANGED while in MOTION.

ROBT. WETHERILL & CO., CHESTER, PA.



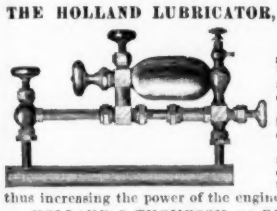
Corliss Engine Builders,
Condensing, Non-condensing, and Compound.
HIGHEST EFFICIENCY AND GREATEST ECONOMY.
Boiler Makers.
Hydraulic Riveting.

LAMBERTVILLE IRON WORKS.



A. WELCH,
Manufacturer of
Patent Automatic
CUT-OFF
Steam Engines
Lambertville, N. J.

THE HOLLAND LUBRICATOR, VISIBLE DROP,



Is guaranteed to be
1. A perfect insurance against the cuttting of Valve-seats, Cylinder and Governor Valves of the engine.
2. It will pay for itself in 6 months' in saving of oil, coal, and packing.
3. It will insure more speed in the revolutions of the engine, any from 1 to 2 strokes per minute, thus increasing the power of the engine. Manufactured by
HOLLAND & THOMPSON, 217 River St., Troy, N. Y.

New & Second-Hand Machinery.

MARCH 13, 1883.

1 Engine Lathe, 14 in. x 6,7 & 8 ft. Grant & Bogert.
1 " " 26 in. x 12 ft. Grant & Bogert. [New.
1 " " 45 in. x 15 ft. Good Order.
1 " " 36 in. x 12, 17 ft. New.
1 " " 42 in. x 14 ft. New.
1 " " 16 in. x 6 ft. & 8 ft. New
1 " " 14 in. x 6 ft. Star Tool Co. "
1 " " 15 in. x 6 ft. "
1 " " 14 in. x 5 & 6 ft. "
1 " " 16 in. x 7 ft. Bridgeport. "
1 " " 13 in. x 5 ft. & 6 ft. Ames. "
1 " " 16 in. x6, 7 & 8 ft. Ames. "
1 " " 18 in. x8 & 10 ft. Lodge & Barker "
1 " " 27 in. x 10 ft. Lodge & Barker.
1 " " 22 in. x 12 ft. "
1 " " 20 in. x 10 ft. New.
1 " " 28 in. x 16 ft. New.
1 " " 24 in. x 12, 14 and 16 ft. New.
1 " " 11 in. x 4 ft. & 5 ft. Prentiss. New.
1 " " 12 in. x 5 ft. Young. New. "
1 Plain Engine Lathe, 16 in. x 4 ft. "
1 " " " 15 in. x 4 ft. New.
1 Fox Lathe, 15 in. x 5 ft. Am. Tool & Machine Co.
1 15 in. x 4 ft. Turret Lathe. Lodge & Barker.
1 Fox Turret Lathe, 16 in. x 6 ft. Lodge & Barker. New.
1 Planer, 50 in. x 50 in. x 17 ft. Good Order.
1 " 16 in. x 16 in. x 3 ft. New.
1 " 22 in. x 20 in. x 5 ft. "
1 " 24 in. x 24 in. x 6 ft. Hendey. new
1 " 26 in. x 26 in. x 7 ft. "
1 Planer, 24x24x5, fair order.
1 16 in. Lever Table Drill. New.
1 Crank Planer, 16 in x 16 x 13 in. New.
1 16 in. Upright Drill. "
1 20 in. Upright Drill. Prentiss. "
1 24 in. " " Prentiss. "
1 30 in. " " " "
1 25 in. swing B.G. & S.F. Drill. Blaisdell. "
1 28 in. " " " " "
1 15 in. Shaper. Gould & Eberhardt.
1 10 in. Shaper. Gould & Eberhardt. New.
1 15 in. Shaper. Hendey. "
1 24 in. Shaper. Hendey. "
1 16 in. Shaper. Hendey. Good Order.
1 9 in. Shaper. Hewes & Phillips. "
1 9 in Shaper. New.
1 12 in. Shaper. New.
Full assortment Milling Machines, Spindle Drills. &c., of Garvin's. New.
1 each Nos. 2 & 4 Screw Machines, Wire Feed, Jones & Lamson.
1 No. 2 Lincoln Miller. Good order
2 No. 2 Lincoln Millers. New.
1 Hand Lathe, 12 x 4, 5 and 6 ft. New.
1 Hand Lathe, 16 in. x 6 and 7 ft. New.
1 Boring and Turning Mill, 72 in. New.
1 Boring and Turning Mill, 50 in. New.
1 Gig Saw. Good as New. Rogers.
1 700 lb. Steam Hammer. Ferris & Miles. Good order
1 Vertical Engine, 8 H. P. Good Order.
1 Horizontal Boiler, 4 ft. x 14½ ft. Good Order.

☞ Through our London branch we are prepared to place American machinery, small tools and novelties on the English and Continental markets. Also to purchase English machinery for delivery here.

NEW YORK AGENCY OF THE TANITE CO., AND GRANT & BOGERT MACHINE TOOL WORKS.
H. PRENTISS & COMPANY, 42 DEY ST., N.Y

ARMSTRONG'S IMPROVED ADJUSTABLE STOCK AND DIES FOR PIPE AND BOLTS.

Tapped to Standard Gauges. *Adjustable* to all variations in the size of fittings. Can be *resharpened without drawing the temper* by simply grinding them. Possessing practical advantages appreciated by all mechanics. Circulars sent free on application.

Manufactured by F. ARMSTRONG, Bridgeport, Conn.

CRAIG'S HYDRAULIC GOVERNOR,

FOR STEAM ENGINES,
The Most Perfect Governor Known.

RUNS IN OIL.

Guaranteed to accurately regulate all classes of engines.

Illustrated and descriptive Catalogue sent on application. Correspondence solicited.

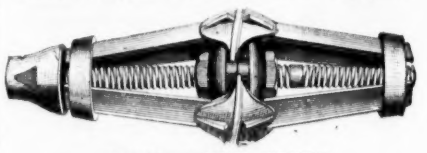
W. H. CRAIG & CO.
Sole Manufacturers,
LAWRENCE, MASS.

E. G. FELTHOUSEN, BUFFALO, N. Y.

Manufacturer of

Patent Flue Scrapers

Ratchet Drills, Gauge Cocks, Cylinder Oil Pumps, &c.



CONSTRUCTION SIMPLE.
Best and Cheapest Flue Scraper made.
C. M. MORSE, Eastern Agent,
Office, 95 LIBERTY ST., NEW YORK.

NEW & SECOND-HAND MACHINERY.

MARCH 8, 1883.

The following New and Improved Machinists Tools are part of what we have for early delivery

1 42 in. swing 20 ft. bed. Engine Lathe. 2 weeks.
1 42 in. " 16 ft. " " " 2 "
1 36 in. " 18 ft. " " " 2 "
1 36 in. " 16 ft. " " " 2 "
1 New Corliss Engine, 16 in. x 42 in. Complete in four weeks.

The following on hand;

1 New Corliss Engine. 12" x 36". Complete.
1 26 in. swing, 12 ft. bed, New Engine Lathe.
1 each, 30 in. " 14,16 & 18 ft. bed. " "
1 30 in. swing, 12½ ft. bed, New Engine Lathe.
1 26 in. " " " "
1 22 in. swing, 12 ft. bed, New Engine Lathe.
1 19 in " 10 ft. " " " "
1 19 in " 8 ft. " " " "
5 18 in. " 8 ft. " " " "
4 15 in. " 6 ft. " " " "
2 11 in. swing, 5 ft., New Engine Lathes.
2 9 in. swing, 3½ ft., New Screw Cutting Foot Lathes
1 Axle Lathe. Fitchburgh Machine Co. Sec'd. Hand.
1 12 in. swing, 6 ft. Hand Lathe.
1 10 in. " 4½ ft. Bed Hand Lathe.
1 30 in. x 12 ft. Iron Planer. N. Y. Steam Eng. Co. 2 hand
1 38 in. x 12 ft. " " New.
1 32 in. x 8 ft. " " "
1 26 in. x 6 ft. " " "
2 30 in. x 8 ft. " Planers. "
2 22 in. x 4 ft. " " "
2 38 in. Swing Upright Drills. B. G. & S. F.
1 23 in. Drill. B. G. & S. F.
1 22 in. Upright Drill. B. G. & S. F.
1 23 in. & 3, 20 in. Drills. Plain.
1 18 in. Bench Drill.
1 each, 3 & 4 Spindle Drill.
1 Double Nut Tapper. Horizontal.
1 12 in. stroke Slotting Machine.
2 each, 12 & 15 in. Shapers. New.
1 13 in. Shaper, Lowell Machine Shop. Second-hand.
1 12 in. stroke Shapers, traveling head, 40 in. traverse double tables New.
1 4½ in. Hyde's Pat. Centering Machines.
1 6 in. stroke Hand and Power Shaper.
3 Wood's Patent Bolt Cutting Machines to cut from ½ in. to 2 in. inclusive. Second-Hand.
2 4 Spindle Drills, 1 Face Milling Machine.
1 Pond's Double Miller, 1 Screw Head Slotter.
1 No. 1 Brown & Sharpe Screw Machine.
1 Bolt Pointing Machine.
2 Double-Acting Presses. 4 Single-Acting Presses.
90 Foot Presses. 1, 00 Fowler Press. 1 Foot Punch, with bench. 1 Railway Saw Bench.
2 Small Punching Presses,
Cold Rolled Shafting, Pulleys, Hangers, Couplings, &c., always in stock.

The George Place Machinery Co.
121 Chambers and 103 Reade Sts., New York.

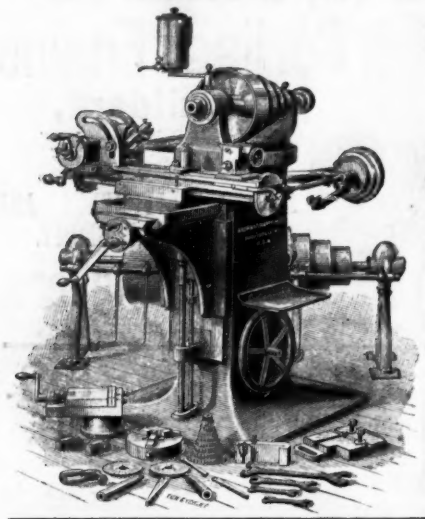
SMALL SIZE

Universal Milling Machine.

MADE BY

BROWN & SHARPE M'F'G. CO.

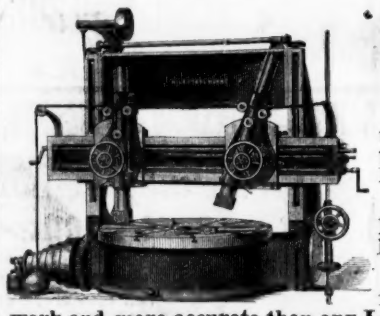
PROVIDENCE, R. I., U. S. A.



This machine has all the movements of a plain Milling Machine, and, in addition, is fed automatically, at an angle to the axis of Spindle, and has an adjustment to stop at any required point. The knee can be moved perpendicularly through a distance of 14 inches, and has a dial giving a reading in thousandths of inches. The Saddle, holding the Spiral Bed also, has a movement, parallel with axis of Main Spindle, of 6 inches, also indicated in thousandths of inches. On the Spiral Bed are placed a Head and Foot Stock, having centers upon which Reamers, Taps, Drills, or Mills can be held for grooving, etc., either straight or spiral, right or left hand. The Head, holding one center can be set at any angle between 5 degrees below a horizontal to a perpendicular position, and upon an Arbor inserted in the Spindle can be cut angular Mills, Cutters, or Bevel-gears. The Head can also be placed at a right angle on the Bed, and operations performed upon the face of work held in a chuck which goes upon the end of Spindle. The Vise shown in cut has Jaws 5 inches wide, 1 inch deep, will open 2¾ inches, and can be clamped upon the Bed at any angle.

☞ Illustrated catalogue sent per mail on application.

BORING AND TURNING MILLS



5, 6, 7, 8, 10, 12, 14 and 16 FEET SWING.

The Pray Mfg. Co., reports—"Can bore and turn **a Pulley 8 feet diameter, 26 inch face,** trim the edges and face the hub in 8 *hours.* Handling included."

Buckeye Engine Co.—"Can bore and turn **a Pulley 12 feet diameter, 27 inch face, in 17 hours,** including handling."

Porter Mfg. Co.—"We are using your mill for **boring cylinders,** and find it does **quicker work and more accurate than any Lathe. Cylinders bored** on this machine are **absolutely perfect,** as near as we can measure.

NILES TOOL WORKS, HAMILTON, OHIO.

Eastern Warerooms. 22 S. Sixth St., Phila., Pa.

Weston's Differential Pulley Blocks,

CAPACITIES FROM ½ TON TO 10 TONS.

ONE MAN CAN LIFT 5,000 POUNDS.

THEY HOLD THE LOAD SUSPENDED AT ANY POINT.
ALL SIZES IN STOCK.

THE YALE LOCK MFG. CO.

Manufacturers, Engineers and Machinists,
PRINCIPAL OFFICE AND WORKS, STAMFORD, CONN.

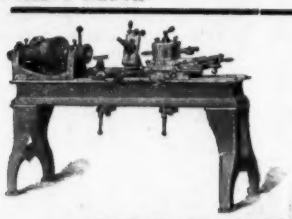
SOLE MAKERS.

SALESROOMS:

NEW YORK—53 Chambers St. PHILADA.—507 Market St.
BOSTON—224 Franklin St. CHICAGO—64 Lake St.

40 page Catalogue of Light Hoisting Machinery furnished on application.

DIRECT BLOCK. GEARED BLOCK



LODGE, BARKER & CO.,

MANUFACTURERS OF

PATENT TURRET LATHES

With Chasing Bar.

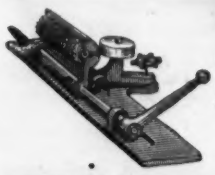
18 inch Swing Engine Lathes, and Small Turret Lathes,

189 & 191 WEST PEARL STREET, CINCINNATI, OHIO.

THE BUFFALO STEEL FOUNDRY, BUFFALO, N. Y.

PRATT & LETCHWORTH, Proprietors.

Orders and correspondence Solicited.



GRAY'S GRINDSTONE DRESSING MACHINE.

OFFICE OF NILES TOOL WORKS,

G. A. GRAY, Jr. & Co. Manufacturers of Machine Tools.

We have tried your Grindstone Dressing Machine, and find it a first-rate tool. It keeps the stone perfectly true, in best shape, and the operation is quickly performed. Yours truly, R. C. McKINNEY, Sec'y.

Send for Circular and Prices,

G. A. GRAY, JR., & CO.,
42 E. 8th St., Cincinnati, Ohio.

EXINUTILI TRADE TANITE MARK UTILITAS

Emery Wheels and Grinding Machines.

THE TANITE CO.

Stroudsburg, Monroe County, Pa.

Orders may be directed to us at any of the following addresses, at each of which we carry a stock:

NEW YORK, 42 DEY STREET.

Boston, High and Oliver Sts.
Philadelphia, 925 Market St.
Pittsburgh, 137 First Avenue.
Baltimore, 59 and 61 German St.
Indianapolis, 206 to 216 S. Illinois St.
Indianapolis, 184 & 186 E. Washington St.
Cincinnati, Cor. Pearl and Plum Sts.
Chicago, 152 & 154 Lake St.
Chicago, 40 Franklin St.
Minneapolis, 254 Second Avenue South.
St. Paul, 316 & 318 Robert St.
St. Louis, 209 N. Third St.
St. Louis, 311 to 319 N. Second St.
New Orleans, Union and St. Charles Sts.
San Francisco, 2 & 4 California St.
Portland, Oregon, 43 Front St.
Sidney, N. S. W., 17 Pitt St.
Liverpool, Eng., 42 The Temple, Dale St.

THE PRATT & WHITNEY CO., HARTFORD, CONN.

Have Ready for Delivery:

Drilling Machines—1, 42 in. table, automatic feed, back gears, quick return movement of spindle; No. 3 vertical, and Nos. 1 and 3, manufacturer's bench; Champion drills; No. 2 gang drills, 4 spindles; Double head traverse; 1, 14 in. Shaping Machine; Hand Lathes, 8, 15 and 18 in. swing; Cutting-off Lathes for 2½ and 4½ in. diameter. Revolving head Screw Machine, No. 1; Hand Milling Machines, No. 3; Bolt Cutters, turret head, No. 2, 3 and 4; National, No. 2, 3 and 4. No. 1 Screw Shaving Machine; No. 1 Screw Slotting Machine. 13 in. Grinding and 16 in. Spinning Lathes. One Double Connection Power Press. 10 in. Pillar Shapers. Index Milling Machines. No. 1 and No. 2 Horizontal and No. 3 Upright Tapping Machines.

Can furnish at 3 to 8 weeks' notice, 30, 34, 36 and 40 in. Planers.

DROP FORGINGS

Of Every Description, from 1-16 ounce to 30 lbs. weight, for

Guns, Pistols, Sewing Machines, Machinists' Tools,

AND MACHINERY GENERALLY.

The Pioneers as a specialty in this line of business. Estimates given promptly on receipt of models Send for Catalogue and Descriptive Circular.

THE BILLINGS & SPENCER CO.

HARTFORD. CONN., U. S. A.

GRANT & BOGERT, Flushing, N. Y.

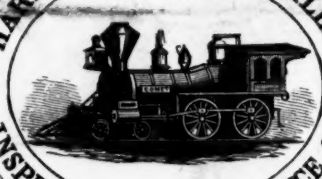
Gentlemen:

We think the best compliment we can give your lathe is to pay for it before it is due; but even that isn't sufficient, and we are glad to say that you have done a splendid piece of work, and we are much pleased with it. It will be of great service to us, and we have now waiting four jobs that none of our other lathes will take. May success and prosperity attend you. Draft enclosed.

Very respectfully,
WARNER & SWASEY.

CLEVELAND, O., Dec. 16, 1882.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.



J. M. ALLEN, PRESIDENT.
W. B. FRANKLIN, VICE-PRESIDENT.
J. B. PIERCE, SECRETARY.

E. E. GARVIN & CO.

139 & 141 Centre St., New York.

MANUFACTURERS OF

MACHINISTS' TOOLS,

Milling Machines,
Drill Presses,
Hand Lathes,
Tapping Machines,
Cutter Grinders, &c.

SEND FOR NEW ILLUSTRATED CATALOGUE containing descriptions of the above machines.

Pond Machine Tool Co.,

SUCCESSORS TO

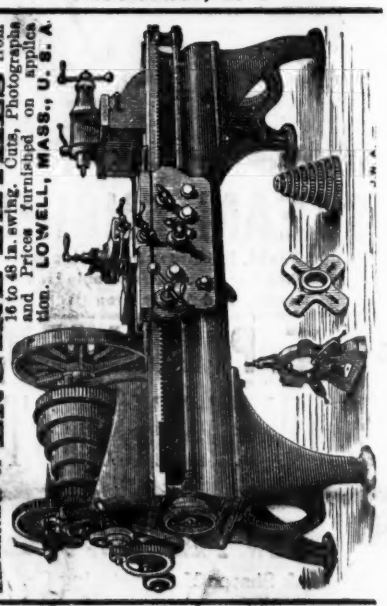
DAVID W. POND,

WORCESTER, - - MASS.

New Designs.
Quick Delivery.
Great Variety.

VOLNEY W. MASON & CO.
Friction Pulleys, Clutches and Elevators,
PROVIDENCE, R. I.

GEO. W. FIELD,
Manufacturer of ENGINE LATHES from 16 to 48 in. swing. Cuts, Photographs and Prices furnished on application. LOWELL, MASS., U. S. A.



ROP HAMMERS

Punching Presses
DIES AND OTHER TOOLS
For the manufacture of all kinds of SHEET METAL GOODS, DROP FORGINGS, &c.
Stiles & Parker Press Co., Middletown, Conn.

THE BABCOCK & WILCOX CO.'S

WATER TUBE STEAM BOILERS.

BRANCH OFFICES:
Boston, 50 Oliver St.
Syracuse, Room 15, White Buildings.
Philadelphia, 32 N. 5th St.
Pittsburgh, 91 4th Ave.

NEW YORK: 30 CORTLANDT ST.

GLASGOW: 107 HOPE ST.

BRANCH OFFICES:
Baltimore, Room 45, Chamber Commerce Building.
Chicago, 48 So. Canal St.
New Orleans 60 Carondelet
San Fra'co, 505 Mission St.

J. M. CARPENTER PAWTUCKET, R. I.

MANUFACTURER OF TAPS & DIES